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# The NEWS

Air Conditioning, Heating and Refrigeration NEWSPAPER

## Statistical Panorama Issue

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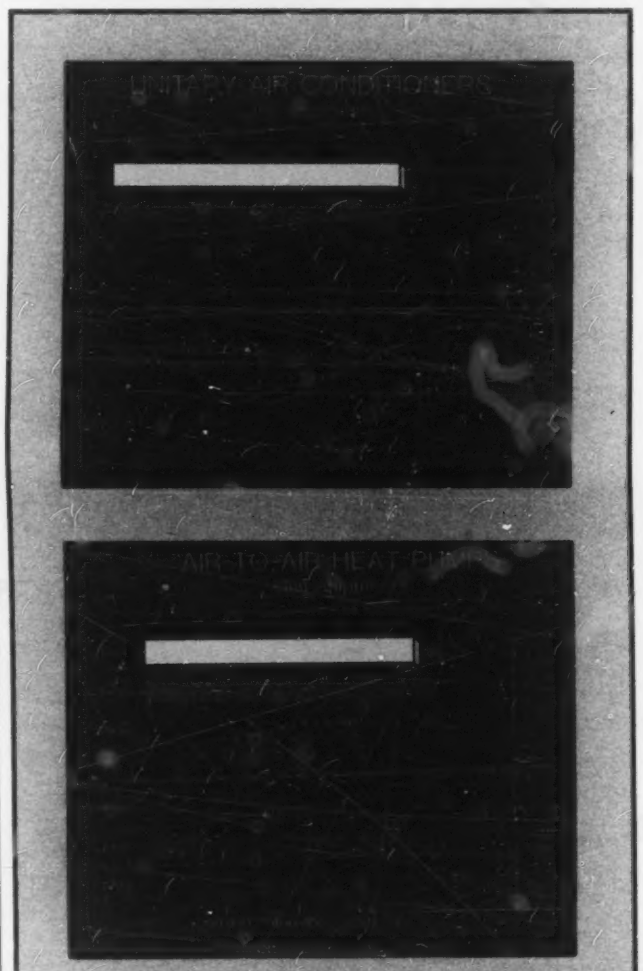
# 1991 markets holding through short recession




*by Gordon Duffy*

It's a year of contrasts. Even with long-term interest rates at relatively low levels, home buyers and developers have been sitting on their hands. However, the recession that came late in 1990 after eight years of steady but unspectacular growth promises to be both shallow and short-lived.

With the duration of the war with Iraq in doubt, and the economy in recession, many home buying and upgrading plans were put on hold. Changes in thrift borrowing requirements, and the threat of commercial bank changes, have tightened money supplies for developers.

We're betting that consumer confidence, at its lowest ebb since the 1982 recession, will rebound by mid-year and spark a modest recovery. It could be more robust but for the fact that consumer debt is near record levels.

For the hvacr industry, these macro events portend little hope for much growth. Comfort cooling shipments, given a couple of sustained hot spells early in the season and a modest increase in replacements, should stay even. Heat pumps, hampered by an overhang of field inventory, probably will be down a bit.

Furnaces, which now account for 2.3 million units a year, should hold even despite further declines among oil-fired units. And boilers, despite a continuing downward slide in their prime Northeast new home market, should make up most of the loss with replacements.

The decline of the office building market will continue until at least 1993. Smaller commercial and retail construction, which held up well through the first half of 1990, is slipping because of lower new home starts over the education and institutional markets.

A bright spot is exports, which last year topped $3.2 billion. That total should grow significantly in 1991 with the need to rebuild Kuwait, the threat to world oil supplies removed, and a favorable dollar in the world market. Imports also grew, but at a slower rate as compressor and room unit imports leveled off.

The outlook could always be brighter. But, in an recession year, it could be a lot worse. No drastic declines are in sight. Competition, however, will be tough across all industry segments.

For more details, read on inside.

# Florida lawmakers amend workers' comp legislation

TALLAHASSEE, Fla. — In a special session, Florida legislators have amended the state's recently rewritten workers' compensation law.

Challenges to the constitutionality of the reformed workers' compensation system, including a circuit court ruling last fall that it violated several provisions of the state constitution, prompted the special session.

Defects found in the law by the circuit court included a violation of the requirement that legislation must deal with a single subject, as a result of its inclusion of provisions relating to international trade and development.

The judge also found a violation of the separation required between judicial and executive authority, as a result of the law's establishment of an appeals panel whose members would be appointed by the governor.

Although the circuit court allowed the law to remain in effect until the Florida Supreme Court issues a ruling, legislators took action to remedy the law's claimed defects.

The Industrial Relations Commission and the Governor's Workers' Compensation Oversight Board were eliminated. The law was also amended to allow construction corporations to exempt up to three officers from coverage, and partners or sole proprietors to exempt themselves.

Major provisions of the new law remain in effect, including a freeze on workers' comp insurance rates until 1992, a 25% rate rollback, and guidelines for maintaining a drug-free workplace.

## Ross Willis named president of Rheem Division; Foster retires

FORT SMITH, Ark. — Ross Willis has been named president of the Rheem Air Conditioning Division.

He replaces Donald F. Foster, who retired after 34 years with the company.

Willis

Foster

The division manufactures the Rheem, Ruud, and the recently acquired WeatherKing lines of central residential and light commercial heating and air conditioning equipment.

Willis, who joined the company in 1970, has held various positions, most recently executive vice president. Foster joined Rheem as a research engineer. His tenure coincided with the growth of the hvac market during the past three decades.

He held many key positions, and was division president since 1985. He also served on the board of the Gas Appliance Manufacturers Association (GAMA) and the Air-Conditioning and Refrigeration Institute (ARI).

## Fauconneau is pres of Carrier Transicold

SYRACUSE, N.Y. — Guy Fauconneau has been named president of Carrier Transicold, succeeding the retiring Bernard Hertel. Fauconneau, an employee of 17 years, has been president of Carrier S.A., Montluel, France, the past four years.

Before that, he was president of the company's Elizondo plant in Monterrey, Mexico; vice president of Carrier International Corp.; and held increasingly responsible positions here in Syracuse, in Lyon, France, and in Working, England.

Hertel, who is retiring April 15, has been president of the Transicold unit since July. 1989. His management positions with the manufacturer stem back to 1973, when Carrier Transicold bought Frigiking, founded by Hertel in 1965.

The Transicold unit manufacturers truck and trailer refrigeration, container refrigeration, marine refrigeration, bus and rail air conditioning equipment, and refrigeration equipment for specialized applications.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# STATISTICAL PANORAMA

## FORECASTS

**Air conditioning** — Another decline in new home starts will be made up by increases in replacements and utility incentive-driven efficiency upgrades to keep 1991 unitary shipments even at 3,700,000 units.

**Heat pumps** — Growing replacements of cooling-only units with heat pumps will not be able to overcome early field inventory overhang completely. Shipments will be down 5% to 770,000 units.

**Furnaces** — A decline in oil furnace shipments, a near-even year for electric furnaces, and a small surge for gas furnaces near the end of the year to beat the efficiency minimums should keep the 1991 total about even at 2,384,000 units.

**Boilers** — Even though new home starts keep sliding in the prime Northeast market, replacements and efficiency upgrades should keep 1991 residential boiler shipments within 2.6% of last year's level at 320,000 units.

**Chillers** — With export markets weakening a bit in the face of slowing economies among major customers, and declining markets at home, chiller shipments will be down 15% this year to 13,400 units.

**Room air conditioners** — Two relatively cool summers in a row resulted in high inventories that will cut deeply into 1991 shipments. We expect a 20% drop to 3,320,000 units but sustained heat waves in the North could provide a surge for a product that relies heavily on impulse buying.

**Commercial refrigeration** — Although the level of supermarket remodels will remain high, new store construction will lag because of four years of new home start declines. However, this stable market should stay almost even this year at 100,000 units.

**Housing** — Tight credit for builder loans, particularly for apartment developers, and flagging consumer confidence promise to drag down new home starts by another 9.5% to 1,080,000 units this year. Indications are, however, that 1991 will be the bottom of the cycle.

**Replacements** — Steady growth in comfort cooling and heat pump replacements make this an overall growth market even in hard times. More than one-fifth of heating-cooling replacements involve replacing equipment in good working order to obtain efficiency improvements.

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When public data were not available for products shipped, *The News* relied on its sources to help provide estimates.

# AIR CONDITIONING

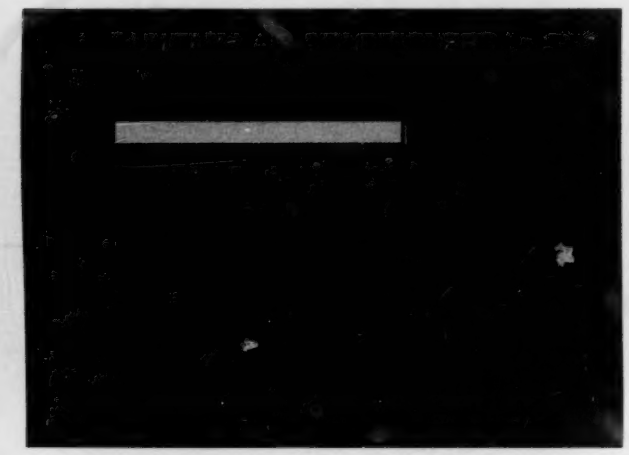
After an exhilarating climb since the 1982 recession that led to record shipments in 1989, shipments of U.S. unitary air conditioners (including air-to-air heat pumps) in 1990 declined by 13.8% to a still formidable 3,728,700 units, according to the Air-Conditioning and Refrigeration Institute (ARI). The record total in 1989 was 4,324,437 units.

The loss reflected continuing declines in new home starts, continued softening of the light commercial market, and the second summer in a row that failed to produce sustained heat waves in key markets. The growth of replacements, which now account for half of the market, was not enough to compensate for the shortcomings of weather and new construction.

Other factors — a downturn in the economy and, especially, in consumer confidence — were aggravated by the war with Iraq. An end to the war, and to the recession by summer, should restore consumer confidence and firm comfort cooling's market base later in the year. Sustained heat waves this summer are unpredictable but could add icing to the cake.

The prospect of federal mandatory minimum efficiency standards in 1992 should have a minimal effect on 1991 shipments. Already high efficiency levels for central air conditioners and heat pumps and the thrust of efficiency rebates by electric utilities probably will tone down efforts by manufacturers to overproduce subminimum units late in the year.

On balance, then, we expect unitary air conditioner shipments to stay even in 1991 at 3,800,000 units.



These figures do not include air conditioning units and heat pumps shipped to foreign markets. Exports of U.S. unitary air conditioners in 1990 totaled 187,600 units, down 39.5% from the 310,205 units exported in 1989. Last year's total, which still is nearly double the average for the decade prior to 1988, was affected directly by the war with Iraq. The Middle East is a prime market for these products.

It should be remembered also that these figures include only those units shipped directly to foreign destinations by original equipment manufacturers (oem's). They include few, if any, units shipped by distributors and contractors.

Of the 3,728,700 unitary air conditioners shipped in 1990, ARI estimates that 85% — or 3,169,395 units — were for residential applications and 15% — or 559,305 units — were for commercial applications.

That ratio has changed from the 83%-17% split used from 1985 through 1988 and the 78%-22% split that held sway through the 1970s and early 1980s. In fact, ARI believes that the push of residential replacements may

## Our unofficial estimates of unitary market shares

When it comes to figuring shares of the unitary air conditioning market held by individual manufacturers, we must depend on "feel" rather than reliable numbers. There are no reliable numbers.

Each year the percentages shift as companies enter or leave the market, as one company is acquired by another, or as distribution and product improvements are reflected in the marketplace.

Each year, for example, *The News* reports a bevy of mergers, acquisitions, or spin-offs involving companies in the hvacr industry.

It must be remembered that, like all national totals, our estimates of market share seldom will provide an accurate picture of what is happening in any specific city or area of the country.

Some essentially regional manufacturers, with a small national market share, often are among the leaders in the areas where their distribution is concentrated.

Another distortion comes from the interest of the reader. Whether a particular manufacturer is strong in new construction, add-on, or replacement sales makes little difference to many. But, for contractors that specialize, the list of competitive brands can expand or contract according to that specialty. It can also change when the contractor's interests change.

Because of these and other situations within their own cities, contractors often get a distorted view of national market shares. For them, and for the market researchers not deeply involved in this industry, *The News* offers these educated guesses of unitary equipment market share in terms of units shipped:

- **Carrier (including Bryant, Day & Night, and Payne) — 21%.**
- **Rheem (including Ruud and WeatherKing) — 14%.**
- **Lennox (including Armstrong, Johnson, and Air Ease) — 13%.**
- **Trane — 11%.**
- **Goodman (Janitrol) — 9%.**
- **Heil-Quaker (including Tempstar) — 9%.**
- **Central Environmental Systems, York International — 8%.**
- **SnyderGeneral (including Arcoaire and Comfortmaker) — 7%.**
- **All others — 8%.**

## Replacements help rooftops outperform smaller products

Replacements helped commercial rooftops more than hold their own last year despite declines in overall unitary shipments and in smaller commercial units.

According to our calculations, commercial rooftop shipments in 1990 totaled 172,200 units, an increase of 1.7% over the 169,300 rooftops *The News* estimated were shipped in the previous year. At the same time, the total commercial unitary market slumped by 13.8% from 648,650 units in 1989 to 559,300 units last year.

Shopping center and other light commercial construction tends to follow closely behind the housing market, which has been in decline for more than four years. The losses in the housing market, and the light commercial new construction it spawns, have been largely compensated by the increase in replacements.

Not only are the rooftops installed in the 1960s and 1970s inefficient by today's standards, many of them are simply worn out. New designs include multiple compressors, many of them scrolls, and microprocessors for better efficiency and control. And rising utility bills have provided owners with incentives to replace old inefficient units.

Commercial rooftops really represent a market application of several different products rather than a specific product type that can be easily tracked statistically.

For example, all-year units are identified by both ARI and the Bureau of the Census and clearly imply a heating capability. However, both single-package and split-system rooftops — though they may have been shipped (and counted) as cooling-only units may have modular heating sections added in the field.

Too, heat pumps imply one, and usually two, methods of heating in addition to their cooling capability. Another complicating factor is that small all-year rooftops are applied in more residential than commercial situations.

*The News* bases its assessment of the commercial rooftop market on the known number of unitary shipments in 1989 and 1990 of 5.4 tons or more, and by past ARI and Bureau of the Census ratios of system types and sizes, and by the residential-commercial unitary split.

Although not as up to date as we would like, the exercise does produce a breakdown within a few percentage points of the latest (1990) ARI reports of equipment sizes.

We have arbitrarily selected 5.4 tons as the starting point for commercial rooftops. We readily admit, however, that there are many commercial units smaller than that, just as there are residential units larger than 5.4 tons. But the line had to be drawn somewhere.

By applying the known — and latest — Bureau of the Census ratios to the 1989 and 1990 ARI shipment figures, we find there were 559,300 commercial units shipped in 1990, a decline of 13.8% from the 648,650 commercial units ARI indicated were shipped in 1989.

By applying ratios evident in the 1989 Bureau of the Census report, we also found that, in 1990:

- 123,900 were split systems, of which 40,600 were rooftops with capacities of more than 5.4 tons. The respective 1989 totals were 148,000 and 36,400.
- 217,600 were all-year single packages, of which 76,900 were rooftops with capacities of more than 5.4 tons. The respective 1989 totals were 260,000 and 79,800.
- 96,200 were cooling-only air conditioners, of which 39,500 were rooftops with capacities of more than 5.4 tons. The respective 1989 totals were 115,000 and 36,500.
- 300 in both years were multi-zones, all of which had capacities in excess of 5.4 tons.
- 121,300 were heat pumps, of which 14,850 were rooftops with capacities in excess of 5.4 tons. The respective 1989 totals were 125,300 and 16,100.

Taken together, there were 172,200 commercial rooftops with capacities in excess of 5.4 tons shipped in 1990. That leaves 387,100 commercial units with capacities of less than 5.4 tons. A breakdown of these units within a segment so heavily weighted toward residential equipment is beyond our abilities.

# AIR CONDITIONING

*(Continued from Preceding Page)*
toward distributors and is in sharp contrast to the 49%-51% split in favor of distributors that held sway for many years.

The shift of inventory to the distributor is a phenomenon that has been growing steadily for a decade. It is almost the same for both heat pumps and cooling-only units. Heat pumps, however, have a slight edge.

## Field heat pump inventories high

Heat pumps continue to be something of an enigma because even though conventional wisdom pointed to a poor year in 1990, they emerged relatively unscathed. They have been known as new construction products yet, when their prime new construction market, the South, dropped 38% over the past four years, they suffered only minor damage.

Shipments of air-to-air heat pumps in 1990 totaled 808,655 units, a decline of 3.2% from the previous year's total of 835,424 units according to ARI.

The shipment decline since the 1987 record year of 918,432 units has been about 110,000 units. Yet, if we look at heat pump penetration rates in the South, the loss should have been in the order of

150,000 units. And because both penetration and total starts have been shrinking in other regions, the difference is the growing replacement market.

Although probably not serious, there is some concern about field inventory. Total heat pump inventory at the end of 1990 was 301,000 units. That's down 20,000 units from a year earlier but the 37.2% of shipments ratio is above the 30% to 33% range that has been a historical norm for unitary equipment. (The ratio for cooling-only units at the end of 1990 was 30%).

Looking deeper, we find that factory inventories at the end of 1990 totaled 91,000 units, or only 30.2% of the total. Field inventories at distributors, on the other hand, totaled 210,000 units or 69.8% of the total.

For contractors, this imbalance means better-than-normal availability of heat pumps from distributors and, quite possibly, better prices. For oem's and suppliers, it means fewer production orders as distributors work off their excess inventory — a condition that could also directly affect orders for cooling-only units.

It would appear that this situation was reflected in the industry's January shipment totals, which were down far more than the year's forecast would indicate.

Indications are that heat pumps, like their cooling-only counterparts, will have no difficulty meeting the 1992 federal mandatory efficiency minimum of 10 SEER. In fact, the sales-weighted average SEER for heat pump shipments in 1990, at 9.46, marked the third year in a row that it bested the average for air conditioners (9.31 in 1990).

The slippage in the national penetration rate of heat pumps in new single-family homes from 30% in 1984 to 24% in 1989 is no cause for alarm. Penetration rates in the South — 45% for single-family homes and 47% for multi-family units in 1989 — have remained constant and, as start rates in the South improve, so will heat pump shipments to that region.

It should be noted also that, in the West, the penetration rate of heat pumps in single-family homes in 1989 was only 10% but, for multi-family units, it was 26%.

Because of uncertainties in the economy and in consumer confidence, forecasting 1991 shipment totals is more difficult than usual. On balance, we believe shipments in 1991 will total about 770,000 units, down 5% from last year's experience.

### Capacity mix

An indication of capacity mix for 1990 unitary air conditioners and how they compared with 1972's experience is shown in the table below.

| | % 1972 | % 1990 |
|---|---|---|
| Under 1.8 ton | 16 | 8.5 |
| 1.8 ton to 26,999 Btuh | 23 | 19.2 |
| 2.25 ton to 32,999 Btuh | 17 | 16.3 |
| 2.75 ton to 38,999 Btuh | 22 | 22.5 |
| 3.25 ton to 43,999 Btuh | 6 | 8.0 |
| 3.67 ton to 53,999 Btuh | 7 | 9.7 |
| 4.5 ton to 64,999 Btuh | 6 | 9.0 |
| 5.4 ton to 96,999 Btuh | 1 | 1.8 |
| 8.1 ton and larger | 1 | 2.9 |

### Installed value

The installed value of both unitary and field-engineered air conditioning systems put in place in 1989, the latest year for which these data are available, totaled a record $22 billion, an increase of 15.8% over the previous year's total of $19 billion, according to ARI.

The $22 billion total covers all comfort cooling systems, with the exception of room air conditioners, installed in the U.S. in 1989, reported David Martz, ARI director of statistics and business research.

The estimated installed value of field-engineered air conditioning equipment in 1989 totaled $8.5 billion, an increase of 25% over the 1988 total of $6.8 billion. The estimated installed value of unitary equipment totaled $13.5 billion, up 9.8% from the $12.3-billion total a year earlier.

In determining the installed value of field-engineered systems, ARI estimates that only 7.5% of the installed cost of the system is represented by the refrigerating machine. The remaining 92.5% represents air-handling equipment, ducts, piping, valves, pumps, controls, labor, and all other installation costs.

Martz said estimates for field-engineered equipment are developed through comparison with government information. The surge in value is based primarily on the expansion of the chiller market reported by the Bureau of the Census. Although shifts in government reporting may alter figures from one year to another, the methodology employed should ensure a reasonable basis for comparison with prior-year figures, he said.

Commercial installations of unitary equipment accounted for $4.3 billion of the 1989 unitary total, an increase of 10.3% from 1988. Residential unitary installed equipment achieved a record $9.2 billion, an increase of 9.5% over the previous year's total.

The growth of the unitary air conditioning market over the past 30 years, particularly among central residential installations, has been steady. From an installed value of $464 million in 1956, the market grew to $1.3 billion in 1966, to $4.1 billion in 1976, and $9.7 billion in 1986 — at least doubling every decade, Martz reported.

The installed value covers the cost of unitary air conditioning equipment as shipped from the factory together with labor, ductwork, registers and grilles, thermostatic and other controls, electrical wiring, and other components of the system installed by contractors.

For the record, the Bureau of the Census reported that 4,263,186 unitary air conditioners were shipped in 1989, the latest year for which these data are available. That represents a 4% increase over the 4,100,173 unitary air conditioners the Bureau said were shipped in the previous year.

### Ptac's

The softened commercial and institutional markets finally caught up with packaged terminal air conditioners (ptac's) and packaged terminal heat pumps (pthp's). After holding steady for two years, the total for the two groups declined by 11.5% from 253,925 units in 1989 to 224,840 units last year.

These products are used extensively in the motel, hotel, nursing home, and suburban office park applications. Overbuilding in the hotel-motel and office building markets has resulted in fewer market opportunities for these primarily new construction products.

The decline was shared almost equally by cooling-only and heat pump units. The ptac portion, 55% of the total, declined 11% from 138,600 units in 1989 to 123,400 units last year. The pthp portion declined by 12% from 115,300 units in 1989 to 101,500 units in 1990.

Ptac's compete head-on with commercial rooftop single-zone and variable air volume (vav) systems in the lower tonnage ranges, and with field-engineered systems in office buildings and hospitals.

The Bureau of the Census reported that 132,382 packaged terminal units were shipped in 1989, the latest year for which these data are available. That represents a 9.4% decline from the 120,971 units the Bureau said were shipped in the previous year.

Taken separately, the Bureau reported that ptac shipments in 1989 totaled 82,306 units, up 25% from the previous year's total of 65,528 units. It said pthp shipments, at 50,076 units in 1989, were down 9.8% from the 1988 total of 55,443 units.

### Water-source heat pumps

Shipments of water-source heat pumps, which serve two distinct market areas, totaled 117,900 units in 1990, down 15% from the 1989 total of 138,700 units.

The older market segment, where we believe all of the decline took place, uses closed loops tied to a small boiler and cooling tower or evaporative condenser to maintain a loop water temperature between 60° and 90°F. They take advantage of load diversity and usually are applied in high-rise apartments or condominiums, and in small or medium-sized office buildings.

The other group, primarily applied in single-family homes, initially used water from a pond, a well, or the ocean at temperatures as low as 45° and were usually confined to rural or exurban areas. In recent years, however, the market has swung sharply to closed vertical or horizontal underground water-glycol loops to provide comfort heating and cooling at high efficiencies.

Most are water-to-air systems, although there are a few water-to-water systems. They don't have to depend on the quantity or quality of the groundwater and can eliminate back-up heat provisions when sized for the design heat load. Pumping costs are reduced, defrost cycles that degrade the efficiency of air-to-air units are eliminated, and they can be applied on small lots in urban areas.

*The News* estimates that about 20,000 residential and a few hundred commercial water-source heat pump systems were ground-

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# AIR CONDITIONING

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coupled in 1990.

They have a comparatively high first cost and ground loops require specialized application knowledge but substantial rebates (often $3,000 and more) by electric utilities in the Midwest and in Canada have encouraged installations in rather narrow geographic areas.

### Heat pump water heaters

Domestic hot water in U.S. homes traditionally has been heated in natural gas-fired and electric resistance storage-type water heaters. A few are fired by oil or LP gas. Desuperheaters on air conditioners and heat pumps help in the South where running hours are long.

Medium-temperature solar systems came in with federal and state subsidies and mostly left when they ended. European instantaneous water heaters have had little impact. And, in the Northeast and parts of the Midwest, some still use water jackets on oil- and gas-fired boilers.

The air-to-water heat pump, with an installed cost more than double that of an electric resistance system, entered the market more than a decade ago with the promise of saving more than 40% in operating cost. Instead of capturing a big chunk of the 7.5 million annual water heater market, it all but disappeared.

The primary reasons, we believe, were complexity and the uneasiness air conditioning contractors experience with plumbing systems and plumbers experience with the refrigeration cycle.

### Integrated appliances

Although there are no figures for integrated appliances, there is no doubt that this niche appliance is becoming more popular, especially in areas where the winter climate is not too severe. We believe it's being held back by the slowdown in housing starts.

These appliances use a conventional gas-fired water heater piped to a water coil in a separate air handler that often includes the evaporator of a split-system air conditioner. Electric water heaters do not have recovery rates fast enough for this system.

The hot water heater supplies both domestic hot water and hot water to the air handler for space heating. It saves by using (for space heating) energy that formerly were domestic hot water storage losses. Special fittings on the storage tank keep plumbers and hvac technicians from becoming involved in each other's trade.

These systems are being applied in both single- and multi-family housing units. The market is being promoted by many gas utilities as a way back into the apartment and condominium markets after they were largely shut out by the early 1980s trend toward individual metering.

Hydronics manufacturers also have offered an integrated boiler and domestic hot water heater system for many years. Air conditioning, if offered, often is in the form of a separate mini-split system of Japanese design. And a few oem's offer air conditioners and heat pumps factory fitted with desuperheaters for domestic hot water generation.

## Inventory glut hurts room units

After two hot summers in 1987 and 1988 that cleaned inventories virtually to the bare walls, room air conditioner shipments have been influenced by two more summers in 1989 and 1990 that were notable for a lack of sustained heat waves in key markets. The result has pushed inventory levels back up to high levels.

Shipments of room air conditioners in 1990 totaled 4,149,900 units, a decline of 18.5% from the previous year's total of 5,091,100 units, according to the Association of Home Appliance Manufacturers (AHAM). The 1989 total was the highest since the 1982 recession.

Because room air conditioners are influenced heavily by impulse buying, forecasts are rarely reliable. We are forecasting a 20% drop in room air conditioner shipments this year to 3,320,000 units based on the state of the present market. Sustained hot spells, particularly in the Northeast, could turn the tables and bring about a slight increase.

We are reminded by AHAM that these shipment totals reflect the units built in the U.S., exports, and those units imported from foreign countries. In 1989, room unit imports from such countries as South Korea, Singapore, Brazil, and Canada totaled 895,136 units. (The total in 1983 was 98,000 units).

Although full-year totals were not available as this was written, the Department of Commerce reported that 879,759 room units were imported during the first nine months of 1990. Exports, influenced heavily by the war in the Middle East, totaled 278,435 units for the same time period.

It should also be noted that two major U.S. manufacturers moved all or most of their room unit production offshore several years ago.

For the record, the Bureau of the Census reported that 3,708,034 room air conditioners were

*(Page 10, Please)*

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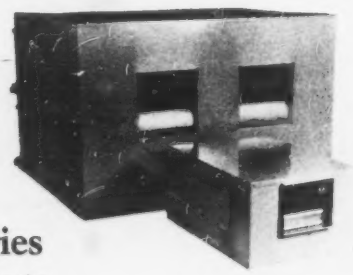

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Circle 6

# AIR CONDITIONING

*(Continued from Page 8)*

shipped in 1989, the latest year for which these data are available. That was a 1.5% increase over the 1988 total of 3,652,368 units.

### Chillers

Exports and domestic replacements continue to keep chiller shipments at a high level despite a soft office building new construction market brought about by much overbuilding in the late 1980s.

Total shipments of chillers in 1990 amounted to 15,760 units, an increase of 4.7% over the 15,050 chillers shipped in the previous year.

After substantial increases in 1988 and 1989, shipments of centrifugal chillers gained only a hair last year to 5,000 units. The total for 1989 was 4,990 units. As in the past few years, we suspect that about one-third of the centrifugals were exported.

It should also be noted that the centrifugal totals since 1985 do not include open-type centrifugals. In the past, we have speculated that open centrifugals account for 400 to 500 domestic market units. The centrifugals also include, we suspect, a few screw compressors.

Reciprocating chillers shipped in 1990 totaled 10,600 units, an increase of 7.3% over the 9,880 recip chillers shipped in 1989. Here again, we expect that exports accounted for about one-third of shipments.

The market for absorption chillers, at 160 units last year, was down 11% from the 180 absorption units shipped in 1989. Production of absorption units also was heavily influenced by export orders.

The future, affected by the war with Iraq, a recession economy, and uncertainty about refrigerant choices, does not look as rosy. December 1990 bookings for reciprocating liquid chillers were down 29% from the same month a year earlier. And December 1990 bookings for large-tonnage liquid chillers (centrifugals) were down 27%.

| Year | Recip. | Cent. | Abs. |
|---|---|---|---|
| 1970 | 10,300 | 4,150 | 1,000 |
| 1971 | 10,000 | 4,000 | 900 |
| 1972 | 10,000 | 3,000 | 900 |
| 1973 | 10,400 | 4,100 | 800 |
| 1974 | 11,000 | 4,500 | 1,000 |
| 1975 | 8,250 | 4,950 | 700 |
| 1976 | 7,600 | 3,400 | 500 |
| 1977 | 8,900 | 3,000 | 450 |
| 1978 | 8,100 | 3,350 | 370 |
| 1979 | 8,100 | 3,350 | 280 |
| 1980 | 9,650 | 4,600 | 280 |
| 1981 | 9,250 | 4,300 | 240 |
| 1982 | 8,500 | 3,600 | 200 |
| 1983 | 7,500 | 3,100 | 140 |
| 1984 | 8,100 | 2,950 | 160 |
| 1985 | 8,160 | 3,490 | 130 |
| 1986 | 7,800 | 3,700 | 160 |
| 1987 | 8,440 | 3,700 | 130 |
| 1988 | 9,800 | 4,400 | 130 |
| 1989 | 9,800 | 4,990 | 180 |
| 1990 | 10,600 | 5,000 | 160 |

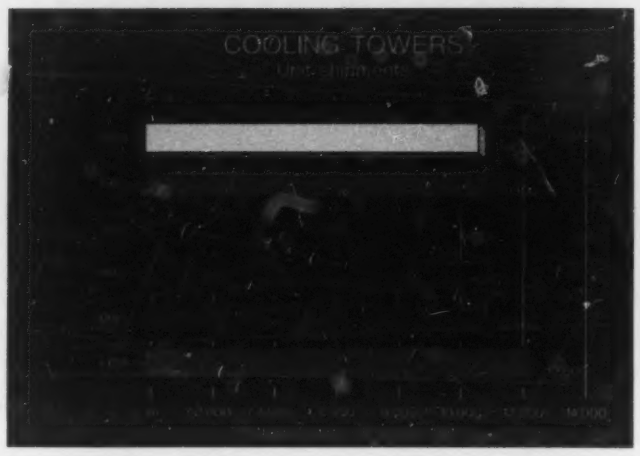
Although some owners and design professionals still have reservations, both chiller manufacturers and refrigerant producers contend that potential obstacles to the use of alternate refrigerants have been cleared away. All of the oem's now offer equipment compatible with alternatives.

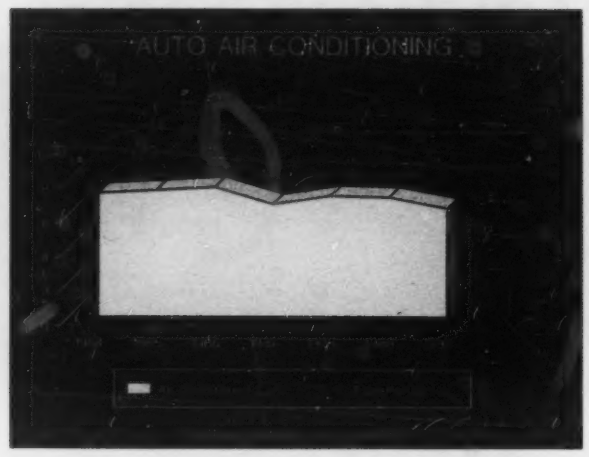
The alternates — HFC-134a in place of CFC-12, HCFC-123 in place of CFC-11, and HCFC-22 — have been developed to replace the CFCs (chlorofluorocarbons) that already are both restricted and taxed and scheduled to be phased out of production by the turn of the century. Both HFC-134a and HCFC-123 are now commercially available from some suppliers and HCFC-22, the mainstay of unitary equipment, will not be limited until the year 2020.

Still underway, however, is the development of the infrastructure required to reclaim and use refrigerant recovered from existing systems, the quality of reclaimed refrigerant required to uphold warranties, and venting and ventilation requirements for refrigerants such as HCFC-123.

For the record, the Bureau of the Census reported that 1,667 centrifugal chillers were shipped in 1989, the latest year for which these data are available, up 14.7% from the 1,453 centrifugals it said were shipped in 1988. Both totals exclude open-type units under 200 tons and over 400 tons.

The Bureau reported that 16,525 reciprocating chillers were shipped in 1989, up 11% from the 1988 total of 14,868 reciprocating chillers. Shipments of absorption chillers, at 748 units in 1989, were down 15% from the year-previous total of 880 units.




## Auto a/c option builds to 92%

According to *Ward's Automotive Reports*, there were 6,361,631 air conditioning units installed on U.S. domestic automobiles in the 1990 model year, down 9% from the 6,995,195 factory air installations made during the 1989 model year.

However, U.S. domestic auto production in the 1990 model year totaled only 6,925,229 units, down 9.9% from the 7,688,215-unit total for the previous model year. That meant that, in the 1990 model year, factory air conditioner penetration was 91.9%, up from 90.1% in the previous year.

Of cars made in the U.S., almost all luxury and full-size models feature factory air conditioning as standard equipment. Some compact and subcompact models, particularly those sold in the northern states, are ordered without air conditioning. Dealers also order a few in standard floor plans in order to advertise lower prices.

Total light truck production in the 1990 model year amounted to 4,247,123 units, an increase of 0.6% from the 4,220,030 light trucks produced in the previous model year. The penetration of air conditioning in the light truck market increased from 77.7% of the light trucks produced in the 1989 model year to 81.3% for the last model year.

For the record, the Bureau of the Census reported that 9,377,441 auto air conditioning systems were shipped in 1989, the latest year for which these data are available. That represents a 7.6% decrease from the 10,149,703 systems the Bureau said were shipped in the previous year.

The Bureau reported that an additional 4,752,926 air conditioning systems for trucks, buses, and off-road vehicles were shipped in 1989, a 43% increase over the 1988 total of 3,325,126 units. The 227,959 recreational vehicle air conditioners the Bureau said were shipped in 1989 represented a 2% decrease from the 1988 total of 232,591 units.

### The aftermarket

The International Mobile Air Conditioning Association (IMACA) estimates that the aftermarket, after a wrenching series of shakeouts, has stabilized at about 750,000 units annually. The agricultural market continues to strengthen, as does the medium-duty truck market.

Mindful of the restricted availability of CFC-12 for automotive air conditioning, both auto companies and aftermarket manufacturers have concentrated their efforts on testing recovery-reclaim systems and developing guidelines and standards for reclaim methods and refrigerant purity.

Autos produced in late 1992 for the 1993 model year are expected to be charged with HFC-134a, an alternative refrigerant that does not harm the earth's ozone layer.

### Evaporative condensers

Shipments of evaporative condensers in 1989, the latest year for which these data are available, totaled 2,264 units. That's a 3.7% increase over the 1988 total of 2,182 units. Of the 1989 total, 83% of the units had capacities of more than 100 tons.

### Fancoil units

Shipments of fancoil units in 1990 totaled 164,500 units, down 9% from the year-previous total of 180,800 units. These figures do not include exports.

According to the Bureau of the Census, a total of 264,474 fancoil units were shipped in 1989, the latest year for which these data are available. That represents a 3.8% increase over the 1988 total of 254,778 units.

Of the units the Bureau said were shipped in 1989, 12% were vertical stack units, 44.2% were vertical units, and 43.8% were horizontal units.

### Cooling towers

According to the Bureau of the Census, total shipments of cooling towers in 1989, the latest year for which these data are available, amounted to 12,529 units. That's an increase of 14.6% over the 10,934 cooling towers the Bureau said were shipped in 1988.

# HEATING

The combination of a comparatively mild winter in major market areas and an 11% drop in new single-family home starts in 1990 proved to be more than enough to bring gas furnace shipments down from the heady record level enjoyed in 1989.

Shipments of gas furnaces in 1990 totaled 1,950,465 units, a 9.8% decline from the previous year's record performance of 2,162,185 units, according to the Gas Appliance Manufacturers Association (GAMA). It followed four years in which gas furnace shipments exceeded 2 million units. The next 2-million-unit year before that was 1972.

*(Page 16, Please)*

# HEATING

*(Continued from Page 10)*

The acknowledged strength of the replacement market and the newer upgrade market is demonstrated by the fact that gas furnace shipments have sustained high levels despite four consecutive years of relatively mild winters and single-family home start declines. Another positive factor is that home starts in the Midwest, the appliance's prime market, have continued strong.

There are some indications, however, that the movement to upgrade operating gas furnaces for reasons of efficiency has not been as successful as hoped. In 1990, for example, only 42% of units shipped had efficiencies at or above the 1992 minimum. A stagnant and then recessionary, economy, mild winters, and relatively stable gas prices are the main reasons. A change in any of these factors could directly affect this comparatively new market.

When it comes to estimating 1991 gas furnace shipments, a major unknown is the effect of the federal mandatory minimums. They require that all residential furnaces and boilers manufactured after Jan. 1, 1992, meet a minimum AFUE (annual fuel utilization efficiency) of 78%. However, units manufactured before that date may be sold after year's end.

The question is whether a few, or most, manufacturers will overproduce units with AFUEs of less than 78% so they may offer lower-priced units for as long as they last in 1992. Too, both distributors and contractors could take delivery of units late in the year which will not meet the 1992 minimums.

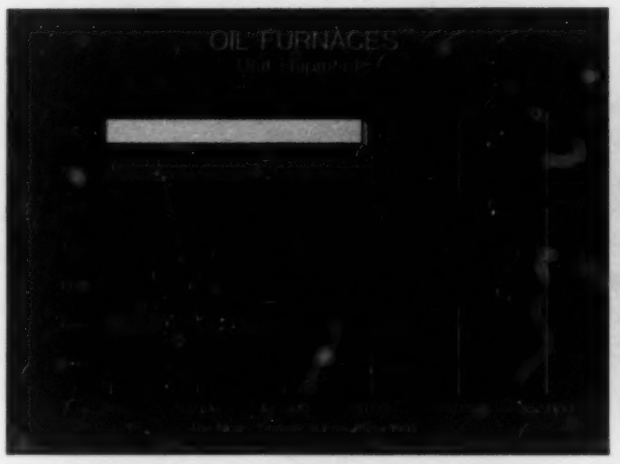
Another new factor, equally hard to quantify, is how many homeowners will replace older operating furnaces with more efficient units. And will contractors take an active role in pre-minimum sales aimed at first-cost conscious homeowners?

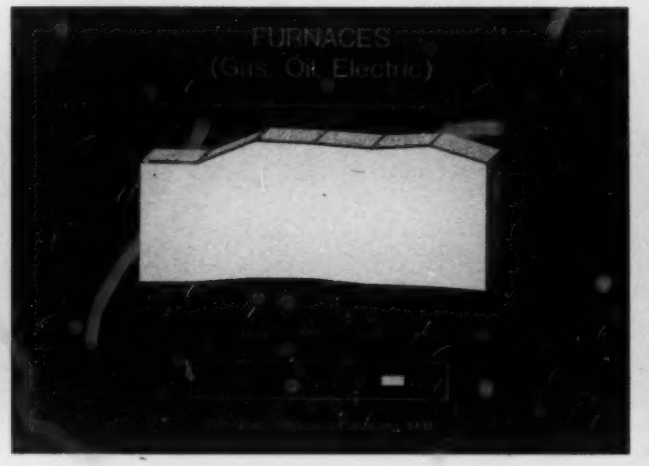
An average of November 1990, GAMA member forecasts indicated that 1991 shipments of gas furnaces would total 1,953,300 units, or on a par with last year's performance. Given an anticipated additional 8% drop in single-family housing starts this year, and a small minimum efficiency-inspired surge late in the year, that seems about right.

It should be noted, too, that GAMA's members project only modest gains through 1994, to about 2.2 million units.

For the record, the Bureau of the Census reported that 2,261,959 gas furnaces were shipped in 1989, the latest year for which these data are available. That represents a 17.4% increase over the 1988 total of 1,926,689 units. The Census Bureau also noted that 1,031 **gravity furnaces** were shipped in 1989, up 7.3% from the 1988 total of 961 gravity furnaces.

Here and elsewhere in this issue, we'll report Bureau of the Census figures where they are available, even though they often vary considerably from industry figures. We favor the industry figures because they are more up-to-date and, in our opinion, are developed by people closer to the market.




## Locked Northeast market hurts oil furnace shipments

The rapid escalation of new and existing home prices in the Northeast, together with a recession economy, has resulted in a second drop in oil furnace shipments in 1990 after three bumper years in the mid-1980s. The real estate market in many areas is locked up as sellers seek the high prices they expect and potential buyers are unable to sell their existing homes.

Shipments of oil furnaces last year totaled 138,455 units, down 22.6% from the 1989 total of 178,980 units, according to GAMA. The drop reflects the precipitous drop in new home starts — 12.2% in 1989 and 26.6% last year — and appears to have been helped only marginally by increased replacement sales.

Replacements have been a major factor in the oil furnace market for many years. However, this market has suffered from a lower rate of existing home sales and a spike in oil prices in the early days of the Gulf War. Although the price of oil rose to $1.48/gal in the Northeast, the bastion of oil heat, it subsided before contractors could make a strong case for replacements on the basis of efficiency.

Oil furnaces should have no difficulty meeting the 1992 federal efficiency minimums. More than two-thirds of oil furnaces shipped during the last two years had AFUEs of 80% or more. And virtually all replacement burners fitted to older furnaces are retention-head or other high-efficiency types.

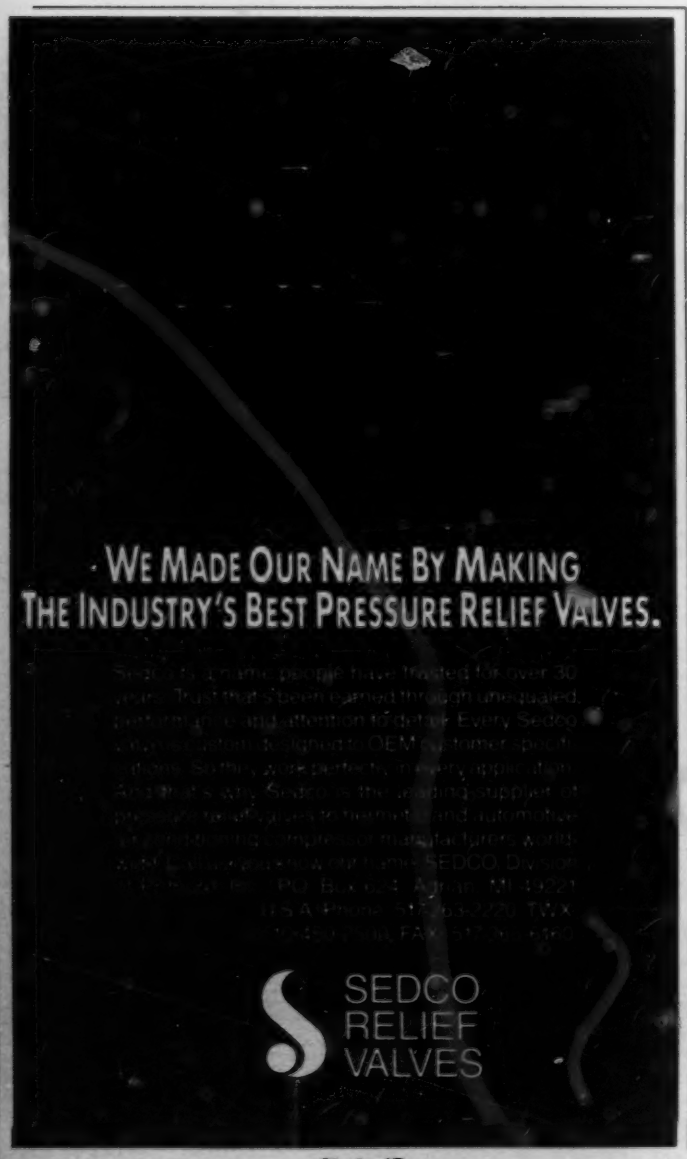
GAMA's members believe oil furnace shipments in 1991 will increase by a hair to 139,100 units and grow gradually to 148,400 units in 1994. We can't agree. It probably will be 1992 before homeowners in the Northeast realize they can't get the inflated prices they have been led to expect for their homes and the real estate gridlock evaporates. That means another 10% decline in oil furnace shipments to about 126,000 units.

For the record, the Bureau of the Census reported that a total of 166,845 oil-fired furnaces were shipped in 1989, the latest year for which these data are available. This represents a 2% decline from the total of 170,120 oil furnaces the Bureau said were shipped in 1988.

## Electric furnace shipments slip 6%

Despite the decline in new home starts last year, shipments of electric furnaces declined by only 6.1%, according to GAMA. The 1990 total was 279,964 units, down from the 298,228-unit total of the previous year.

The primary role of the electric furnace has been to serve as a backup heat source for air-to-air heat pumps, and as a sole heat source for homes in relatively mild

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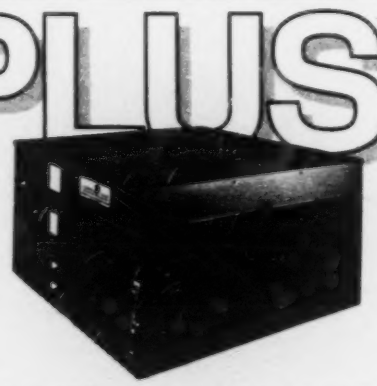

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Circle 10

## HEATING

climates. Unlike its gas- and oil-fired cousins, it enjoys only a small replacement market.

Its principal market is in the South. In fact, the more than 100,000-unit decline of electric furnace shipments since 1987 has followed closely the drop in new home starts in that region.

An average of GAMA member predictions puts the 1991 shipment total at 292,300, or almost equal to the 1988 level, and a steady upward climb to 337,500 units by 1994. We tend to agree as single-family home starts in several Southern markets are starting to edge upward.

For the record, the Bureau of the Census reported that 529,596 electric forced-air furnaces and duct furnaces were shipped in 1989, the latest year for which these data are available.This represents a 3.6% increase over the 1988 total of 511,272 units for the two combined categories.

### All furnaces

Total gas, oil, and electric furnace shipments in 1990 amounted to 2,368,884 units, down 10.2% from the year-previous total of 2,639,393 units. A record 2,687,935 units were shipped in 1986.

It's interesting to note that, in 1972 when the previous combined shipment record was set, new homes led the applications parade as starts topped the 2-million mark. In more recent times, replacements and upgrades are leading the applications parade as new home starts sink to half of the rate in the early 1970s.

Looking ahead, we expect the total for gas, oil, and electric furnaces in 1991 to remain essentially flat at 2,370,000 units. This reflects a slight increase in replacements and upgrades, another decline in new home applications.

The Bureau of the Census reported that 1,672 solid fuel (coal, coke, wood) furnaces were shipped in 1989, the latest year for which these data are available. That was an 18.9% decline from the 1988 total of 2,061 units. The Bureau also reported that 1,240 mechanical stokers were shipped in 1989, down 17.6% from the year-previous total of 1,504 units.

### Boilers get help from replacements

Despite another precipitous 26.6% drop in home starts in its prime Northeast market, boiler replacements and upgrades held 1990 shipments to within 2.3% of the previous year's total. Virtually all of the decline was in steel boiler shipments.

Shipments of **cast iron and steel boilers** in 1990 totaled 328,737 units, a decline of 2.3% from the 1989 total of 336,406 boilers, according to The Hydronics Institute (HI).

The strength of the replacement and upgrade markets is demon-

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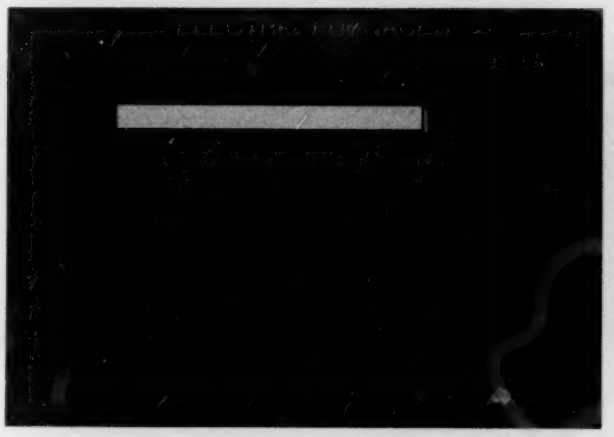

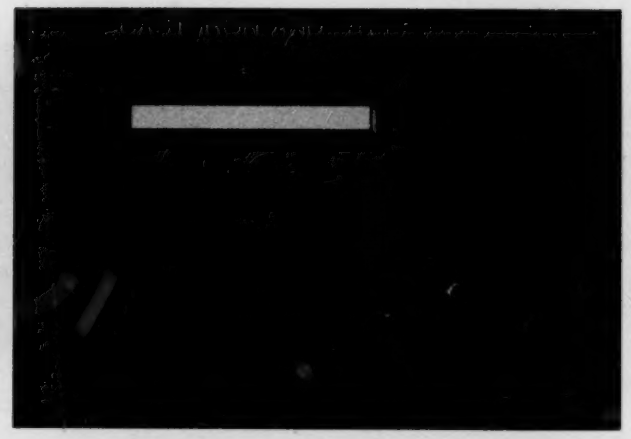


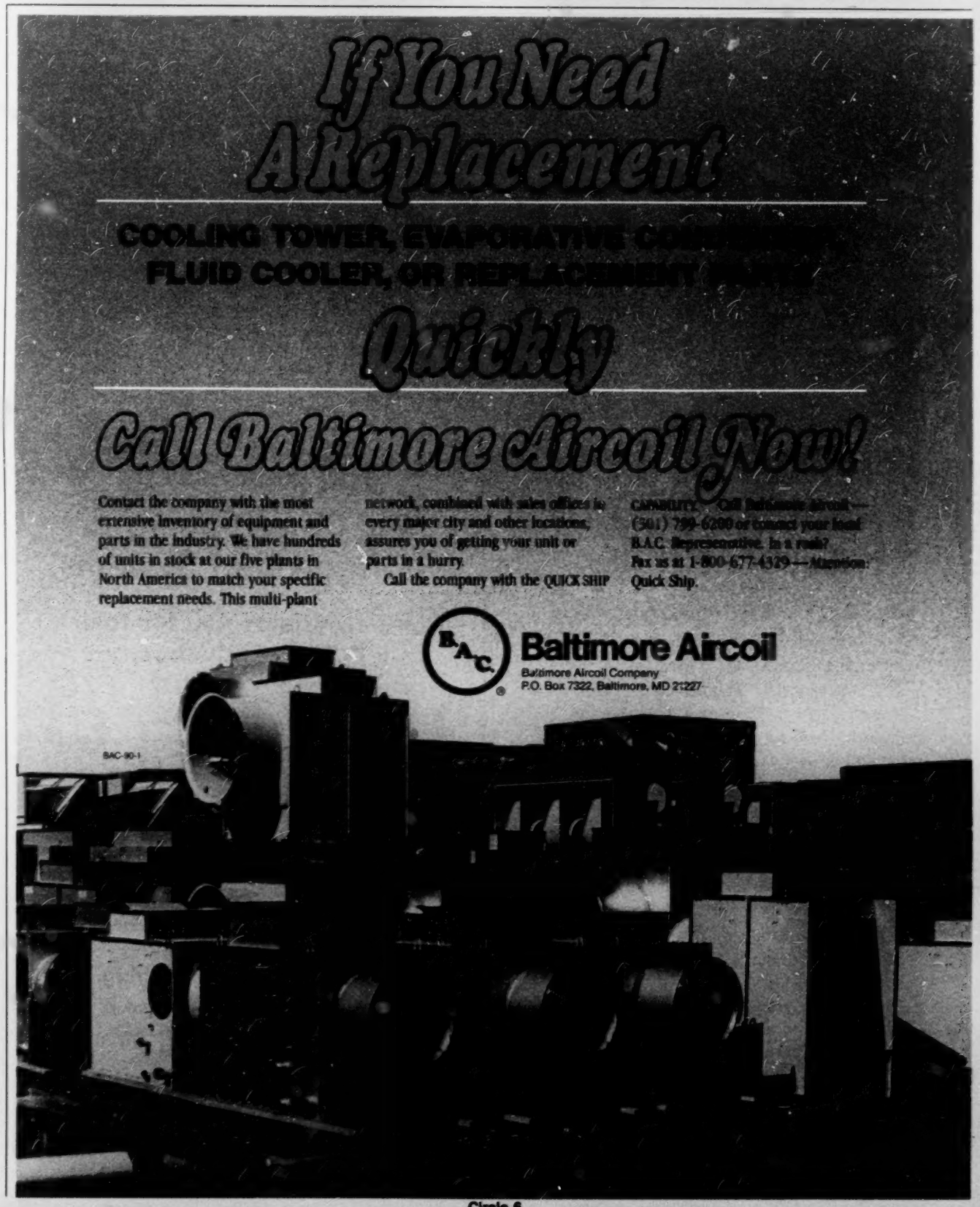
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## HEATING

*(Continued from Preceding Page)*
strated by the fact that boiler shipments have managed two small increases along with two small declines since 1986 while new home starts in the Northeast have tumbled from 293,500 in 1986 to 131,000 last year.

Shipments of **cast iron boilers**, at 302,681 units in 1990, were down only a hair from the 1989 total of 303,074 units, according to HI. Shipments of **steel boilers**, however, were down 21.8% from 33,332 units in 1989 to 26,056 units last year.

Gas-fired cast iron boilers continue to dominate the market but it wasn't always so. Gas curtailments during the early and middle 1970s restricted the sale of gas boilers but, with the sudden availability of natural gas near the end of that decade, coupled with the second oil price shock, there was a surge in demand for gas-fired units.

The gas share of the cast iron boiler market peaked at 85% in 1980 from a low of 50% only three years earlier. In 1990, it was 64.5%, up from 59.8% a year earlier. Total shipments of gas-fired cast iron boilers in 1990 amounted to 195,319 units, an increase of 7.7% from the 1989 total of 181,326 units.

Oil's share of the cast iron boiler market, which peaked at 49.5% in 1977 and dropped to only 15% three years later, was 35.5% in 1990, down from 40.2% a year earlier. Total shipments of oil-fired cast iron boilers in 1990 amounted to 107,362 units, down 11.8% from the previous year's total of 121,748 units.

The share of cast iron water boilers, at 82% in 1990, was virtually identical to the previous year's experience. Similarly, the 1990 share for steam boilers, also remained almost constant at 19%. Shipments of cast iron hot water boilers, at 248,067 units in 1990, were down a hair from the 1989 total of 248,359 units. Steam boiler shipments last year, at 54,614 units, also were down a fraction from the 54,715-unit total for 1989.

In the case of **steel boilers,** oil continued to dominate in 1990 with an 86.9% share. Gas-fired units, at 2.5% of shipments, and bare (no burner) boilers, at 10.6%, gained only marginally.

Most of the 21.8% loss in steel boiler shipments came at the expense of oil-fired units. The 22,645 oil-fired steel boilers shipped in 1990 was 22.7% less than the 29,309 units shipped in 1989. Shipments of gas-fired units, at 640 last year, were down only 8.3% from the 698 shipped in 1989. Shipments of bare boilers, at 2,771 units in 1990, were down 16.7% from the previous year's total of 3,325 units.

**Radiation shipments in 1990,** according to HI, were:

**Convectors** — 1,724,005 sq ft EDR (equivalent direct radiation) in 1990, down 2.5% from 1,768,225 sq ft EDR shipped in the previous year.

**Baseboard** — 11,432,893 lineal feet last year, down 14.5% from the 1989 total of 13,365,228 lineal feet.

**Commercial finned tube** — 6,219,467 sq ft EDR in 1990, down 17.8% from the previous year's total of 7,561,843 sq ft EDR.

**Finned tube** — 1,222,094 lineal feet last year, down 16.6% from the 1989 total of 1,469,018 lineal feet.

Given a less severe drop in new home starts in 1991 in the Northeast and Midwest markets, together with continuing strong replacement and upgrade markets, we look to boiler shipments to more than hold their own in 1991. Look for an increase in the order of 5%.

For the record, GAMA reported total gas-fired boiler shipments in 1990 amounted to 204,004 units, up 6.4% from the 1989 total of 191,803 units. Similarly, it reported total oil-fired boiler shipments of 112,069 units in 1990, down 13.8% from the previous year's total of 129,975 units.

The Bureau of the Census reported that 283,671 cast iron boilers were shipped in 1989, the latest year for which these data are available. That represented a 19.2% decline from the 351,019-unit total reported by the Bureau in 1988.

It reported that gas-fired cast iron boiler shipments, at 163,757 units in 1989, were down 13.4% from the previous year's total of 189,196 units. No steel boiler shipment figures were given for 1989.The Bureau also reported that 1,802,363 sq ft EDR of cast iron radiators were shipped in 1989, down 11.8% from the 1988

*(Page 20, Please)*

### 1990 cast iron boiler shipments by fuel

| Gross output, Btuh | Gas-fired | Oil-fired | Total |
|---|---|---|---|
| Less than 50,000 | 8,827 | 28 | 8,855 |
| 50,000 to 74,999 | 23,133 | 154 | 23,287 |
| 75,000 to 99,999 | 53,089 | 6,392 | 59,481 |
| 100,000 to 124,999 | 51,877 | 39,407 | 91,364 |
| 125,000 to 149,999 | 20,417 | 7,232 | 27,649 |
| 150,000 to 199,999 | 16,522 | 38,776 | 55,298 |
| 200,000 to 249,999 | 11,013 | 5,903 | 16,916 |
| 250,000 to 449,999 | 6,989 | 3,651 | 10,640 |
| 450,000 to 949,999 | 2,146 | 2,449 | 4,595 |
| 950,000 to 1,549,999 | 704 | 1,337 | 2,041 |
| 1,550,000 and over | 602 | 2,033 | 2,635 |
| **Total** | **195,319** | **107,362** | **302,681** |

### 1990 cast iron boiler shipments by thermal capacity

| Gross output, Btuh | Steam | Water | Total |
|---|---|---|---|
| Less than 50,000 | 1,111 | 7,744 | 8,855 |
| 50,000 to 74,999 | 1,137 | 22,150 | 23,287 |
| 75,000 to 99,999 | 8,245 | 51,236 | 59,481 |
| 100,000 to 124,999 | 14,415 | 76,867 | 91,282 |
| 125,000 to 149,999 | 5,426 | 21,225 | 27,651 |
| 150,000 to 199,999 | 9,632 | 45,666 | 55,298 |
| 200,000 to 249,999 | 5,191 | 11,725 | 16,916 |
| 250,000 to 449,999 | 3,787 | 6,853 | 10,640 |
| 450,000 to 949,999 | 2,173 | 2,422 | 4,595 |
| 950,000 to 1,549,999 | 1,053 | 988 | 2,041 |
| 1,550,000 and over | 1,444 | 1,191 | 2,635 |
| **Total** | **54,614** | **248,067** | **302,681** |

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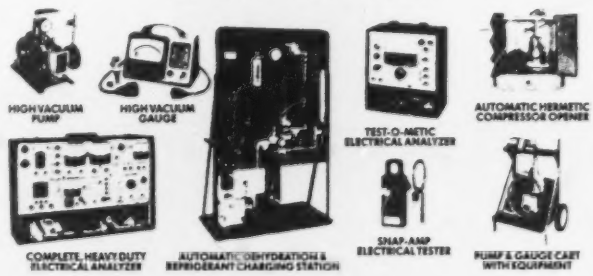
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# HEATING

*(Continued from Page 18)*

total of 2,044,502 sq ft EDR.

### Commercial boilers

The small commercial/industrial boiler market for 1991 is expected to total 23.5 million pounds of steam per hour (pph), down 8% from the 1990 actual sales level of 29.6 million pph, according to the American Boiler Manufacturers Association (ABMA).

The trade association expects shipments of large industrial boilers in 1991 to reach 29.1 million pph, down 13.6% from 1990 actual sales of 33.7 million pph.

The cogeneration market in 1990 totaled 1,911 megawatts (MW), according to ABMA. Forecasters are looking for a 19% decline this year to a total of 1,555 MW.

Forecasters project a combined 1.7 million pph market for municipal solid waste units in 1991. It includes both mass-burn and refuse-derived fuel (RDF) units. There were no sales of these units in 1990.

Watertube fluid-bed combustion units in 1991 are expected to total 7.3 million pph (combined pressurized and atmospheric), or 20% more than the 1990 level of 6.2 million pph. Atmospheric units continue as the main contributor.

The forecast of [illegible] units for the burner group in 1991 represents a 5% increase over the 1990 total of 16,694 units. The forecast calls for an increase among burners with capacities below 25 million Btuh and a decline in the power burner sector.

The forecast for stokers in 1991, at 26 units, represents a 136% increase over total 1990 sales of 11 units.

For the record, combined domestic and export orders for utility boilers in 1991 are expected to decline by 33.9% to 4,100 MW from the 1990 sales level of 6,200 MW. Although exports accounted for the majority of the megawatts sold in 1990, domestic and export sales will share equally this year.

## 1990 steel boiler shipments

| Gross output, MBh | Oil-fired | Gas-fired | Bare | Total |
|---|---|---|---|---|
| Up to 100 | 4,788 | 199 | 576 | 5,563 |
| 101 to 125 | 9,104 | 175 | 1,077 | 10,356 |
| 126 to 150 | 4,443 | 48 | 745 | 5,236 |
| 151 to 175 | 2,678 | 8 | 271 | 2,957 |
| 176 to 200 | 774 | 35 | 40 | 849 |
| 201 to 300 | 556 | 26 | 18 | 600 |
| 301 to 500 | 146 | 38 | 8 | 192 |
| 501 to 750 | 88 | 47 | 10 | 145 |
| 751 to 1,000 | 33 | 25 | 8 | 66 |
| 1,001 to 1,400 | 23 | 13 | 5 | 41 |
| 1,401 to 2,350 | 12 | 18 | 13 | 43 |
| 2,351 to 3,350 | 0 | 8 | 0 | 8 |
| **Total** | **22,645** | **640** | **2,771** | **26,056** |

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### More gas products

Shipments of **gas-fired unit heaters**, at 157,926 units in 1990, were down 14.3% from the 1989 total of 184,263 units, according to GAMA.

Of that total, 149,512 were propeller fan-type unit heaters in 1990, down 13.7% from the year-previous total of 173,208 units. Blower-type unit heater shipments in 1990 totaled 8,414 units, down 23.9% from the 1989 total of 11,055 units.

GAMA's members expect unit heater shipments in 1991 to drop a bit further, to 154,000 units, but climb steadily to 170,000 units in 1994.

It should be noted that the Bureau of the Census reported that 635,723 gas-fired unit heaters were shipped in 1989, the latest year for which these data are available. It represented a 1.8% increase over the 624,202 unit heaters the Bureau said were shipped in the previous year. The government figures obviously include the production of manufacturers who do not participate in the industry program.

**Gas-fired duct furnace** shipments declined by 20.1% from 20,158 units in 1989 to 16,112 units last year. GAMA expects shipments in 1991 to hold about even.

**Gas-fired residential wall furnace** shipments in 1990, at 150,930 units, declined by 13% from the 1989 total of 173,410 units, according to GAMA.

The category does not include wall furnaces installed in recreational vehicles. It does include vented wall furnaces, which dropped 9.1% from 105,710 units in 1989 to 96,060 units last year, and direct-vent wall furnaces, which declined by 19% from 67,700 units in 1989 to 54,870 units last year.

The Bureau of the Census reported that 327,027 gas-fired wall furnaces were shipped in 1989, the latest year for which these data are available. That was an increase of 1.1% over the 323,319 wall furnaces the Bureau said were shipped in the previous year.

Shipments of **recreational vehicle heating systems** were not available from GAMA again in 1990 because of the risk of disclosing individual manufacturer production numbers. The total for 1988 was 235,518 units.

Shipments of **gas-fired floor furnaces** in 1990, at 18,042 units in 1990, were down 2.4% from the

*(Page 22, Please)*

## HEATING

*(Continued from Page 20)*

1989 total of 18,477 units, according to GAMA. The Census Bureau reported that 19,110 gas-fired floor furnaces were shipped in 1989, the latest year for which these data are available. That represents an 11% decline from the 21,474 floor furnaces the Bureau said were shipped in 1988.

GAMA reported that a total of 317,775 **gas-fired room heaters** were shipped in 1990, an increase of 4.2% over the previous year's total of 304,880 units. However, GAMA expects a 10% drop this year in room heater shipments and not much recovery until 1994 at about 331,000 units.

Of the 1990 total, 72,081 were vented room heaters, down 17.4% from the 1989 total of 87,314 units. Another 245,694 room heaters in 1990 were unvented types, up 12.9% from the 1989 total of 217,566 units.

### More about oil

**Oil burner installations** in 1990 totaled 471,000 units, a decline of 15.1% from the previous year's total of 555,000 installations, according to *Fuel Oil & Oil Heat* magazine. The publication reports dealer sales rather than manufacturer shipments.

Of these, 38,000 were installed in new single-family homes, down 19.1% from the 47,000 new home installations in 1989. New home installations totaled 85,000 in 1979.

The new home market in the Northeast, the prime market for oil-fired systems, peaked in 1986. Since that time, successive drops of 8%, 12%, 24%, and 27% in new home starts have been caused by high prices and a faltering economy. Another drop of about 10% is expected in 1991.

There were 190,000 **replacement oil burners** sold last year, a decline of 14.8% from the 223,000 replacement burners sold in 1989.

Unlike other heating systems, there is little or no price difference between old-style burners and the retention-head or other high-efficiency designs. As a result, the magazine reports, virtually all replacements are high-efficiency units.

*Fuel Oil & Oil Heat* estimates that 154,000 oil furnaces were installed in 1990, down 16.7% from the 1989 total of 185,000 furnaces. Another 126,000 oil-fired boilers were installed last year, down 14.3% from the 147,000 oil boilers installed in 1989.

**Conversions** to oil from other fuels totaled 29,000 in 1990, according to the magazine, down 25.6% from the 39,000 conversions reported in 1989.

The Bureau of the Census reported that 18,720 **separate commercial/industrial oil burner units** were shipped in 1989, the latest year for which these data are available. That represents a 15.4% decline from the 22,123 commercial/industrial units shipped in 1988. Another 2,917 industrial/commercial oil burners were shipped with boilers in 1989, an increase of 26.6% over the 2,304-unit total for the previous year.

The Bureau reported that, in 1989, a total of 464,774 **separate residential oil burners** were shipped in 1989, down 14.1% from the 541,065 units shipped in 1988. It reported that 54,552 residential burners were shipped in 1989, down 10.5% from the 1988 total of 60,975 units, and that 57,047 residential oil burners were shipped with boilers in 1989, almost the same as the 57,016 units shipped in the previous year.

Shipments of **oil-fired floor and wall furnaces** in 1989 totaled 2,469 units, down 15.2% from the 1988 total of 2,912 units.

### Other heating equipment

Additional perspective on the total comfort space heating market is provided by the Bureau of the Census. It reported that, for 1989, the latest year for which these data are available, a total of 842,644 **domestic heating stoves** were shipped, down 10.6% from the 942,143 domestic heating stoves shipped in 1988.

Of these:

- 247,656 were **gas heating stoves,** in 1989, an increase of 53.4% over the 161,468 gas heating stoves shipped in 1988. This category includes radiant types as well as vented and unvented circulating types.
- The total for **wood-burning appliances,** at 336,643 units in 1989, was down 25% from the 449,273 wood burners shipped in the previous year.

They include 19,737 circulating-type wood stoves shipped in 1989, down 43.2% from the 1988 total of 34,751 units; 19,709 radiant-type wood stoves shipped in 1989, down 48% from the 1988 total of 37,962 units; and 16,892 wood stoves of other types shipped in 1989, down 55.3% from the 37,755-unit total for 1988.

**Fireplaces** include 14,993 free-standing types shipped in 1989, down 28.6% from the 20,998 units shipped in the previous year; 264,572 zero-clearance fireplaces shipped in 1989, down 2.6% from the 1988 total of 271,539 units; and 30,740 fireplace inserts shipped in 1989, down 33.6% from the 1988 total of 46,268 units.

- **Stoves burning other fuels** such as kerosene, gasoline, fuel oil, or coal shipped in 1989 totaled 228,305 units, down 31.1% from the previous year's total of 331,402 units.

Of the **other electrical heating equipment:**

- 101,163 were nonresidential infrared or electric unit heaters shipped in 1989, an increase of 7.6% over the total of 93,989 units for the two products in 1988.
- 1,240,025 were electric baseboard heating units (excluding glass panels) shipped in 1989, down 23.2% from the 1988 total of 1,615,341 units.
- 1,533,324 were fixed electric space heaters shipped in 1989, down 2% from the 1988 total of 1,564,862 units.

# Census reports gain for solar in 1989

From its peak in 1980, when 303,102 solar collectors of all types were shipped, the solar collector industry has been in decline. The drop was dramatic after 1985 with the expiration of the 40% residential and 15% business energy tax credits.

According to the Bureau of the Census, however, shipments of solar collectors in 1989 (the latest year for which these data are available) totaled 65,214 units, an increase of 11.2% from the 1988 total of 58,621 units.

The 1988 total represented the first increase (0.4%) in the solar market since 1980. It should be noted that the solar market still is dominated by low-temperature (under 110°F) collectors mostly used to heat swimming pools. In 1989, for example, this market segment accounted for more than 90% of the total.

Shipments of low-temperature collectors in 1989 totaled 59,170 units, an increase of 12.8% over the 52,436-unit total for the previous year. Shipments in 1989 of medium-temperature (110° to 180°) collectors totaled 6,044 units, down 2.3% from the 1988 total of 6,185 units.

No figures were given for high-temperature, evacuated, or concentrating collectors. Nor was there a breakdown of air or liquid units.

# COMFORT AND CONSTRUCTION

For contractors operating in the residential-light commercial market only a decade ago, there were few options for customers already sensitized by a fourfold increase in natural gas prices, a doubling of electricity costs, and the second oil price shock brought on by decontrol.

The atmospheric gas furnace with standing pilot, a low-cost inherently reliable mainstay for two generations, was having its relatively low efficiency boosted with electronic ignition and thermal flue dampers. Retention-head oil burners already were a major factor in that market and electric resistance heat was beating a fast retreat from the Northeast and Midwest markets.

On the cooling front, the introduction of two-speed condensing fans and compressors, together with the combination of smaller compressors and much-increased condenser surfaces, upgraded efficiencies at substantial increase in cost. Contractors also were finding that homeowners were demanding the availability of comfort cooling in increasing numbers even if they were using it more conservatively.

Against this backdrop, the market was flooded with setback thermostats, many produced by small electronics firms, available at local hardware stores. And there were many other approaches ranging from devices to recover heat from flue pipes to room circulating fans designed to eliminate stratification. Wood stoves became a popular option.

A total of 247 manufacturers produced 19.4 million sq ft of solar collectors a decade ago, goaded by 40% tax rebates for homeowners and 15% rebates for business. Of these, 7.1 million sq ft of medium-temperature collectors were used for domestic hot water and a few space heating applications. The solar market was rife with experimental and developmental systems.

Contractors active in the large commercial and institutional markets found energy conservation was the watchword. Many electric demand-limiting and duty cycle systems were introduced, some of which were extremely hard on equipment and produced occupant discomfort.

And, of course there were the infamous emergency building temperature regulations which sacrificed comfort for questionable energy savings. They were in response to President Carter's edict that saving energy was the "moral equivalent of war," or meow as many responded.

On the industrial front, major energy-saving strides were taken quietly, mostly in the area of heat reclaim and recovery.

### How it has changed

The changes over the last decade have been remarkable in terms of attitude, marketing approaches, and equipment development and control.

On the home front, the atmospheric gas furnace will have all but disappeared from the marketplace when the federal mandatory efficiency regulations become effective next January. They require an AFUE (annual fuel utilization efficiency) of 78% for all residential gas- and oil-fired furnaces and boilers.

In the interim, the industry has witnessed the decline of flue dampers and new generations of furnaces using power burners, pulse combustion, microprocessor controls, and other combustion technology to produce seasonal efficiencies as high as 96%. Condensing furnaces and boilers have become commonplace, although there were some serious developmental problems for some.

The advent of the pulse combustion furnace nearly a decade ago also brought about a watershed in marketing practices. A suggested installation price of two to three times that of an atmospheric gas

*(Page 26, Please)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Space heating fuel** | | | | | | | | | | |
| **Gas** | 587,000<br>54% | 85,000<br>45% | 162,000<br>84% | 164,000<br>36% | 176,000<br>71% | 596,000<br>58% | 81,000<br>51% | 163,000<br>85% | 158,000<br>38% | 194,000<br>76% |
| **Electricity** | 402,000<br>37% | 43,000<br>23% | 22,000<br>12% | 282,000<br>62% | 53,000<br>22% | 352,000<br>34% | 29,000<br>18% | 22,000<br>11% | 252,000<br>60% | 49,000<br>19% |
| **Oil** | 60,000<br>6% | 57,000<br>30% | —<br>— | 3,000<br>1% | —<br>— | 50,000<br>5% | 45,000<br>28% | —<br>— | 3,000<br>1% | —<br>— |
| **Other/none** | 36,000<br>3% | 3,000<br>1% | 6,000<br>3% | 8,000<br>2% | 18,000<br>7% | 28,000<br>3% | 4,000<br>2% | 5,000<br>2% | 7,000<br>2% | 13,000<br>5% |
| **Heating system type** | | | | | | | | | | |
| **Central heating** | 1,003,000<br>92% | 170,000<br>91% | 184,000<br>98% | 431,000<br>94% | 218,000<br>88% | 956,000<br>93% | 149,000<br>94% | 161,000<br>95% | 395,000<br>94% | 230,000<br>90% |
| **Warm air ducted** | 928,000<br>86% | 105,000<br>56% | 176,000<br>94% | 429,000<br>94% | 215,000<br>86% | 890,000<br>87% | 91,000<br>57% | 178,000<br>93% | 393,000<br>94% | 227,000<br>89% |
| **Warm air furnace** | 648,000<br>60% | 80,000<br>43% | 166,000<br>88% | 215,000<br>47% | 185,000<br>74% | 648,000<br>63% | 73,000<br>46% | 169,000<br>89% | 206,000<br>49% | 200,000<br>78% |
| **Heat pump** | 280,000<br>26% | 25,000<br>13% | 11,000<br>6% | 214,000<br>47% | 30,000<br>12% | 242,000<br>24% | 19,000<br>12% | 9,000<br>5% | 187,000<br>45% | 27,000<br>10% |
| **Hydronic** | 75,000<br>7% | 65,000<br>35% | 5,000<br>2% | —<br>— | 3,000<br>1% | 66,000<br>6% | 58,000<br>36% | 3,000<br>2% | —<br>— | 3,000<br>1% |
| **Built-in electric** | 43,000<br>4% | 16,000<br>8% | 5,000<br>2% | 13,000<br>3% | 10,000<br>4% | 37,000<br>4% | 8,000<br>5% | 7,000<br>4% | 12,000<br>3% | 10,000<br>4% |
| **Other built-in** | 36,000<br>3% | —<br>— | 3,000<br>1% | 13,000<br>3% | 20,000<br>8% | 33,000<br>3% | —<br>— | 3,000<br>1% | 12,000<br>3% | 17,000<br>6% |
| **With central air conditioning** | 810,000<br>75% | 97,000<br>52% | 136,000<br>71% | 428,000<br>94% | 148,000<br>60% | 785,000<br>77% | 86,000<br>54% | 139,000<br>73% | 394,000<br>94% | 164,000<br>64% |
| **Space heating fuel** | | | | | | | | | | |
| **Gas** | 198,000<br>44% | 40,000<br>64% | 58,000<br>63% | 20,000<br>14% | 80,000<br>52% | 187,000<br>42% | 38,000<br>64% | 51,000<br>67% | 20,000<br>16% | 67,000<br>43% |
| **Electricity** | 238,000<br>54% | 16,000<br>29% | 32,000<br>35% | 116,000<br>85% | 70,000<br>46% | 215,000<br>54% | 16,000<br>27% | 22,000<br>29% | 109,000<br>84% | 68,000<br>52% |
| **Oil** | 4,000<br>1% | 3,000<br>6% | —<br>— | —<br>— | —<br>— | 5,000<br>1% | 4,000<br>7% | —<br>— | —<br>— | —<br>— |
| **Other** | 7,000<br>2% | 1,000<br>1% | 1,000<br>1% | —<br>— | —<br>— | 11,000<br>3% | 1,000<br>2% | —<br>— | —<br>— | —<br>— |
| **Heat Pump** | 118,000<br>26% | 10,000<br>15% | 11,000<br>12% | 66,000<br>48% | 32,000<br>20% | 105,000<br>26% | 8,000<br>13% | 2,000<br>2% | 61,000<br>47% | 34,000<br>26% |
| **With air conditioning** | 375,000<br>84% | 55,000<br>88% | 85,000<br>96% | 137,000<br>99% | 98,000<br>63% | 328,000<br>83% | 49,000<br>81% | 65,000<br>90% | 127,000<br>96% | 84,000<br>64% |
| **Mobile home placements** | 224,000 | 23,000<br>10% | 39,000<br>17% | 131,000<br>59% | 32,000<br>14% | 203,000<br>100% | 20,000<br>10% | 39,000<br>19% | 113,000<br>56% | 31,000<br>15% |
| **With central air conditioning** | 148,000<br>66% | 4,000<br>18% | 16,000<br>40% | 78,000<br>60% | 10,000<br>33% | 100,000<br>49% | 3,000<br>15% | 16,000<br>41% | 71,000<br>63% | 10,000<br>33% |

SOURCE: Census Bureau. All numbers are rounded. "Built-in electric" includes electric baseboard, panel, or radiant heat. "Other built-in" includes room or space heaters, floor or wall furnaces, solar, and other types of heating.

## COMFORT AND CONSTRUCTION

*(Continued from Page 24)*

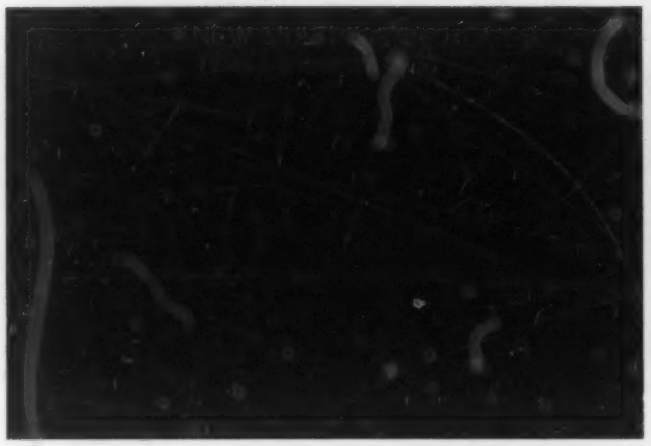
furnace amused competitors until it was proven that substantial numbers of homeowners in colder climes were willing to scrap working inefficient furnaces for fuel savings in the 50% range.

Within two years, virtually every furnace manufacturer offered condensing furnaces to supplement those in the 80% to 86% efficiency range. For the past four years, condensing furnaces have captured more than 15% of the market and those in the 80% to 86% range have accounted for a similar amount. Most of the installations have been replacements of existing furnaces in good working order.

All of this brings us to the problem facing the furnace industry next year. When the minimum efficiency standards become effective next January, contractor customers will face the double price shocks of higher prices for furnaces and higher maintenance costs.

With the new standards in mind, the Gas Appliance Manufacturers Association (GAMA) changed its method of tracking efficiencies in 1990. Of the total 1,950,450 gas-fired furnaces shipped last year, 57.9% (or 1,130,162 units) had efficiencies below the 78% AFUE minimum that will become effective in 1992.

Of the remainder, 24.6% (or 479,761 units) had efficiencies of 78% but less than 88%, and 17.5% (or 340,527 units) had AFUEs higher than 88%. In short, the move to higher efficiencies stalled about 1986 and has shown little upward movement since that time.



There is a distinct possibility that at least some furnace manufacturers will overproduce sub-78% AFUE units this fall because the minimum efficiency regulations allow manufacturers to sell, in 1992, units that were produced prior to the deadline.

The problem is much smaller with oil-fired furnaces, where AFUEs of 80% or more already accounted for two-thirds of production in 1989 and nearly another one-third were within shouting distance at 75% to 80%. GAMA reported that, last year, 85.6% (or 118,518 units) had efficiencies in the 78% to 92% range. Only 14.4% (or 19,940 units) had AFUEs below 78%. And even though no units were reported with AFUEs higher than 92%, we did spot one oil-fired condensing furnace at this year's industry show.

Meanwhile, the industry still debates whether or not it's best to use outdoor air for combustion. Air-to-air heat exchangers, used more extensively in Canada to maintain ventilation and prevent humidity buildup in tightly sealed homes, have not been widely accepted in the U.S. Work continues on getting local code approvals for plastic gas distribution piping within structures.

And, in conjunction with comfort cooling, there is a small movement by major and smaller manufacturers to substitute a central system using zoning dampers for the multiple separate systems now preferred by contractors for large homes.

The American Gas Association (AGA) reported that, in 1989, there were 181,338 conversions from an alternate fuel to natural gas. Of these, 105,854 (58.4%) came from oil, 23,421 (12.9%) came from propane, 36,446 (20.1%) came from electricity, and 15,617 (8.6%) came from other fuels.

AGA forecast that there would be 220,000 conversions in 1990 and 300,000 more in 1991. On the other side of the coin, *Fuel Oil and Oil Heat* magazine reported there were 29,000 conversions from other fuels to oil in 1990, down from 39,000 the previous year.

On the horizon are regulations, already in force in several California communities, which place strict (40 Ng/J) limitations on nitrous oxide emissions. Should these regulations spread, they will place heavy emphasis on the development of new burners and eliminate the return to a national market that the federal minimums promised.

### Air conditioners

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Circle 39

## COMFORT AND CONSTRUCTION

ment customers represent more than twice the new home construction market and more than half of the commercial market.

Condenser surfaces were first expanded and, in the last few years, contracted as enhanced fin surfaces and turbulent-flow tubing designs were developed. More efficient reciprocating and scroll compressors were introduced. Sound levels were reduced, especially with the availability of units equipped with variable-speed inverters.

The Air-Conditioning and Refrigeration Institute (ARI) reported that, for the 1990 shipments of residential unitary air conditioners, the sales-weighted average SEER (seasonal energy efficiency ratio) was 9.31, up from 9.25 a year earlier.

Unlike furnaces, the transition to the 1992 federal minimum of 10 SEER probably will create few ripples in the marketplace. Although only about 20% of shipments last year met or exceeded the 1992 minimums, another 60% of shipments is within the SEER 9 and 10 range. Only about 20% of shipments had SEERs below 9.

A major benefit of the federal mandate will be the elimination of state minimums. Not only have they created a number of minimarkets that destroy economies of scale, but the "me, too" and "me, toughest" syndromes promised much worse conditions in the future.

More important than state minimums in promoting higher cooling efficiencies have been the more than 50 incentive programs launched by summer-peaking electric utilities. They find that a $300 to $600 incentive to homeowners and contractors for higher-efficiency equipment is less expensive than $1,500 a peak kilowatt for new capacity.

There is considerable speculation about what utilities will do when the federal minimums are enforced next year. Many believe the incentives will continue but that the rewarded efficiencies will involve units with SEERs of 12 and above.

It is significant that there is plenty of room for competition above the minimums. Even today there are many units available in the SEER 12 to 14 range and a few have pushed to 17 and beyond. The integration of domestic hot water heating drives the efficiencies even higher.

The number of gas utilities offering incentives to homeowners is much smaller and, for the most part, have involved no- or low-interest loans. A growing number, however, are offering cash incentives to commercial and institutional customers who use gas for comfort cooling. The fuel oil and LP gas industries, to the best of our knowledge, do not offer any efficiency incentives.

### Heat pumps

Heat pumps still are largely a southern phenomenon, as are electric furnaces. The furnaces tend to be used as a sole heat source in the South and as a backup heat source in the North. Both are favored when cooling seasons are long and when heating requirements are minimal.

These factors have been amply illustrated during the last four years, when housing starts in the South declined by 38%, or 302,600 units. This decline explains why heat pumps, which served 30% of all new single-family homes built in 1985, declined to a 24% share in 1989. Even so, heat pump penetration in the South stayed relatively constant at 45% for single-family homes and 47% for multi-family units.

A small market that surged, then almost disappeared, and is now beginning a modest revival is the replacement of split-system air conditioners with heat pumps on gas and oil furnaces. The heat pump provides summer cooling and heating during the spring and fall. The furnace takes over for the winter. The switching point depends on relative fuel prices.

The phenomenon is driven in today's market largely by the efficiency incentives offered by electric utilities. Some gas utilities resent the practice because they lose spring and fall revenues and have tried to levy demand charges to recover some of that revenue.

The performance of air-to-air heat pumps has improved to a point where, in 1990, the 9.46 SEER sales-weighted average for heat pumps with capacities of 65,000 Btuh or less edged ahead of the 9.31 average for their cooling-only cousins for the third year in a row. The 1989 average for heat pumps was 9.26.

It is significant that replacement air-to-air heat pumps which, by our calculations, did not cross the 100,000-unit annual shipment threshold until 1985, accounted for 250,000 or more replacements over the past three years.

A relatively new approach, the integrated system, is enabling gas utilities to compete with heat pumps in some markets. It consists of a gas-fired water heater that provides domestic hot water and space heating. An air conditioner evaporator or indoor heat pump coil can be added to the separate air handler containing a hot water coil.

Although these systems have yet to materially impact the heat pump market, they have enabled gas utilities to regain some apartment and condominium market share lost when owners moved to individual metering. The gas industry, too, continues to push the development of a gas-fired heat pump.

Though their numbers are much smaller, water-source heat pumps using closed earth-coupled vertical or horizontal loops have been making themselves felt in northern markets, particularly in the Midwest. They have been used in the South, particularly in Florida where a closed loop is unneces-

*(Page 31, Please)*


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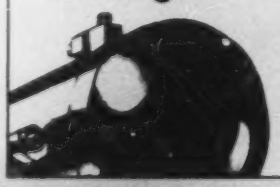

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# COMFORT AND CONSTRUCTION

(Continued from Page 27)

sary, for many years.

There are no reliable statistics for the number of earth-coupled closed-loop systems. However, *The News* estimates that, in 1990, the total was in the vicinity of 20,000 units. Utilities in Indiana and in Ontario now offer incentives of up to $3,000 (which covers all or most of the ground loop cost) because of their exceptionally high efficiencies for both heating and cooling.

### Commercial systems

In the case of rooftops and large commercial equipment, advances in compressors and in combustion have been supplemented by more widespread use of microprocessors and variable-speed drives. Two major manufacturers now mount microprocessors on both rooftops and field-engineered system components so they can be operated locally or linked to a sophisticated central ddc (direct digital control) system.

Large control systems, once anchored to a custom computer, now use PCs routinely. Overlay communications networks and plug-in modules now allow both pneumatic and electronic control components to work in harmony in the same building.

Open protocols that allow new and old systems of different manufacture to operate together are already in place in Europe. And, in the U.S., the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) is within a year of developing such a protocol.

These systems, which grew out of a need for energy management, now are being used as much to ensure comfort throughout a building as they are to save money on energy usage. They also have a major role to play in resolving the growing concerns about indoor air quality.

High electric time-of-day and demand rates also are pushing the development of cogeneration, water and ice storage systems, and desiccant cooling. All now represent a comparatively small market share. These shares are certain to grow and, on the horizon, are ice storage systems for residential applications.

We can look forward to more extensive use of inverter drives, microelectronics, scroll, screw, and dual compressors, enhanced heat exchangers and combustion techniques, and more integration of comfort and domestic hot water systems.

One utility, Pacific Gas and Electric Co., has launched a $50 million customer information system for its 7.5 million San Francisco area customers to better manage their use of natural gas an electricity. The program will show a customer's history, cost of energy used, and suggested steps toward better energy management.

A market research firm, FIND/SVP, estimated that 2.6 million electronic thermostats worth nearly $110 million were sold in the U.S. in 1990. It represents an 18% compound annual growth rate over 1987 unit sales of 1.5 million thermostats.

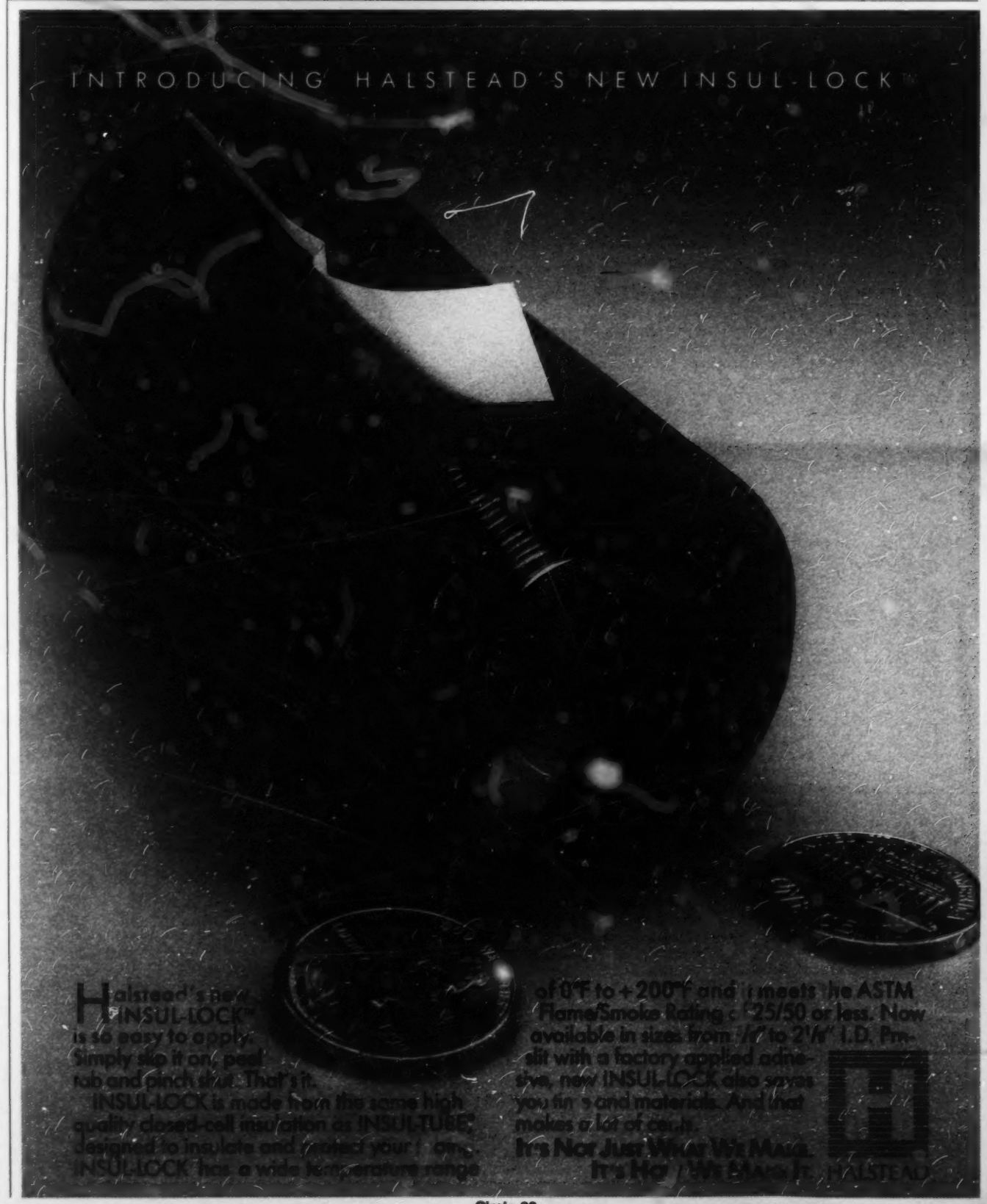
Although some trends are evident when comparisons are made from one year to the next, a look at what has happened to new home construction over five years provides a better perspective. There are several significant trends for the years 1985 through 1989. They include:

• The penetration of central air conditioning in single-family homes has continued upward from 70% in 1985 to 77% in 1989. The biggest gains have been in the Midwest (59% to 71%) and West (49% to 64%), but the Northeast (42% to 52%) also showed significant gains.

• Among multi-family units, air conditioning penetration slipped a bit from 88% in 1985 to 83% five years later. It's explained by the sharp drop in starts in the South, where almost all multi-family units are equipped with comfort cooling, and strength in the Northeast — and to a lesser degree in the Midwest and West — where penetration rates are lower.

• In the battle of the fuels, the change for single-family homes was dramatic. Electricity slipped from a 49% share in 1985 to 34% in 1989. The natural gas share, or the other hand, increased from 44% to a commanding 58% share five years later. Oil, helped by the

(Next Page, Please)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## COMFORT AND CONSTRUCTION

*(Continued from Preceding Page)*

mini-boom in the Northeast, increased its share from 3% to 5% during the same period while "other" fuels slipped from 4% to 3%.

• In the multi-family sector, electricity again slipped from a 67% share in 1985 to a 54% share in 1989, while natural gas climbed from 31% to 42% in the same time frame. Oil remained constant at 1% and "other" fuels increased from 1% to 3%.

• The 6% drop in heat pump penetration, from 30% in 1985 to 24% in 1989, is explained by its popularity in regional markets. In the South, where the market has declined by 38% over the past five years, heat pump penetration remained constant at 45%. In the Midwest and West, heat pump penetration dropped by half. And in the Northeast, which wound up with the highest penetration rate at 12%, it dropped by a third.

• It was a slightly different picture for multi-family units where heat pump penetration dropped from 29% to 26% over the five years. The most dramatic drop (from 14% to 2%) was in the Midwest, while the South (from 39% to 47%) and the West (from 24% to 26%) increased penetration. The Northeast also gained (from 11% to 13%).

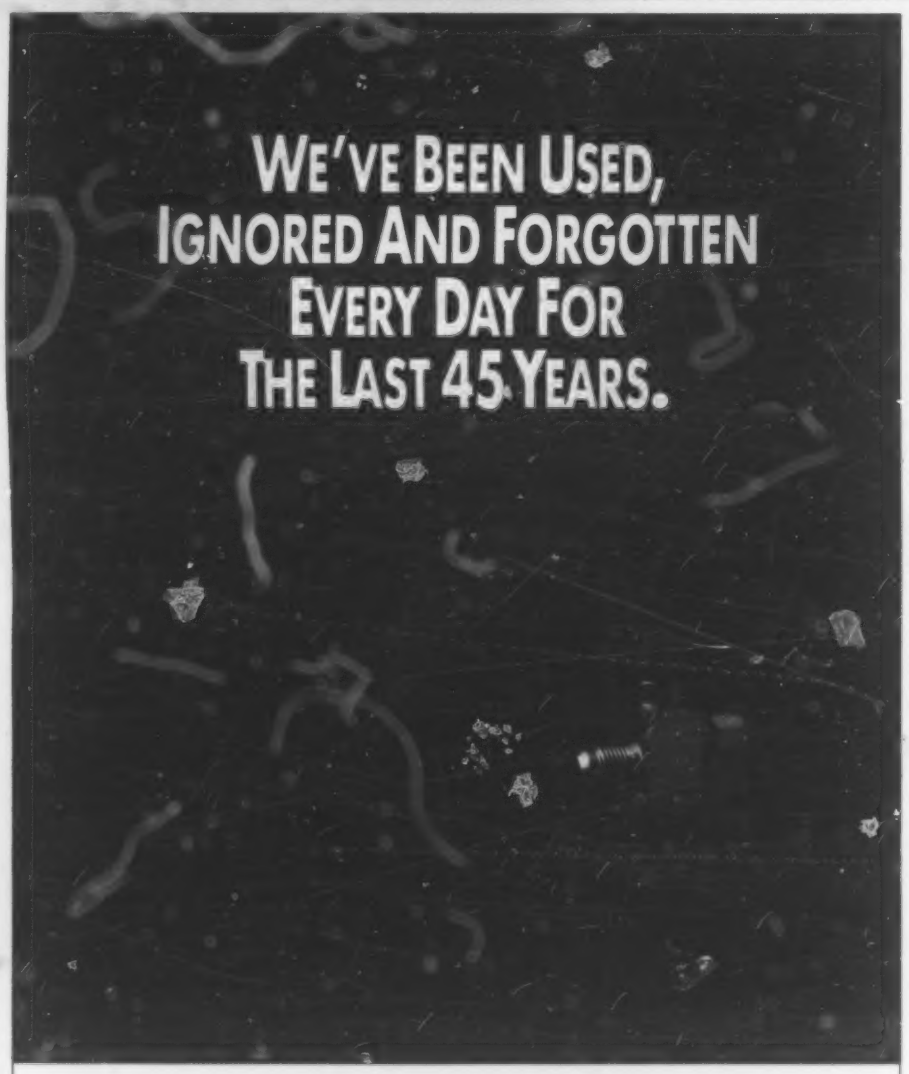
• In the case of other heating equipment in single-family homes completed in the years 1985 through 1989, the penetration of furnaces increased from 54% to 63%. The increases were across the board, except for the South, which remained constant at 49%.

• Hydronic heating systems, which held a 7% national share during the surge of construction in the Northeast in 1986 through 1988, dropped to 6% in 1989. In the Northeast, however, the share rose from 27% to 36% over the five-year period.

• Built-in electric heat (resistance baseboard, ceiling cable), with its reputation for high operating costs, dropped from a 7% national share of the single-family new home market in 1985 to 4% five years later. The biggest drop was in the Northeast, where it slipped from 17% in 1985 to 5% in 1989.

• For the more than 200,000 mobile homes placed in each of the years 1985 through 1989, the penetration of central air conditioning increased from 45% to 49%. In 1989, it ranged from 15% in the Northeast to 63% for those placed in the South. As might be expected, the penetration in single-wide units was 44% and, in double-wides, it was 56%.

**Each *Statistical Panorama* includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.**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# Education, health care facilities lead nonresidential market

Expenditures for nonresidential construction in 1990, at $86 billion, were down 13% from the 1989 total of $98.5 billion, according to F.W. Dodge Division of McGraw-Hill, Inc. The outlook for 1991 is for an additional drop of 7% to $80.3 billion.

Industrial construction, which showed strong gains in 1988 and 1989, fell victim to the slowdown in the economy last year and fell precipitously by 42% to $7.3 billion from $12.6 billion in the previous year. The outlook for 1991 is for another 3% decline to $7 billion but continuing growth in exports promises more increases in the years ahead.

Office building construction, hampered by overbuilding and high vacancy rates in many cities, plummeted another 27% last year (from $23.3 billion in 1989 to $16.4 billion in 1990). The outlook for 1991 is for another 14% decline to $14.2 billion. In fact, an upturn is not anticipated until 1993.

It is significant, however, that the replacement of chillers, control systems, and other major components now slightly exceeds new construction demands in this still-large market.

Construction of stores and other retail establishments, at $13.3 billion last year, was down only 5% from $14 billion in 1989. Successive drops in new home construction, however, will take their toll in 1991 when the construction level in this category will drop by 19% to $10.8 billion.

Warehouse construction, at $6 billion in 1990, was down by 22% from $7.7 billion in 1989 but, in 1991, is expected to drop only 3% to $5.8 billion.

The bright spots in the nonresidential market last year were education and health care facilities and government buildings. Education facility construction, with a total value of $15.3 billion last year, was up 6% from $14.5 billion in 1989.

Construction value of hospitals and other health care facilities in 1990 totaled $8.9 billion, up 1% from $8.8 billion a year earlier. And government building construction, at $5.3 billion last year, was up 2% from the year-previous total of $5.2 billion. Each of these markets in 1991 is expecting small increases (to 4%) or to hold even.

In real terms — sq ft of floor space — the 1991 outlook for nonresidential construction is for a decline of only 8% from 1.12 billion sq ft in 1990 to 1.025 billion sq ft this year, according to F.W. Dodge.

Office building construction is expected to decline by 9% from 165 million sq ft in 1990 to 150 million sq ft in 1991. Construction of stores and other retail establishments is expected to drop 14% from 475 million sq ft last year to 410 million sq ft in 1991. Industrial construction, at 125 million sq ft in 1990, is forecast to drop 4% to 120 million sq ft this year.

Similarly, education facility construction is expected to decline from 141 million to 139 million sq ft, or 1%; hospital and health care facilities from 69 million to 66 million sq ft, or 4%; and other nonresidential buildings from 145 to 140 million sq ft, or 3%.

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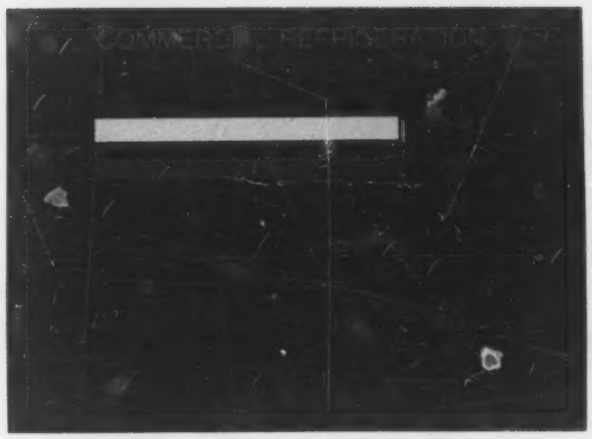
Circle 12


# REFRIGERATION

A slowing economy that slightly reduced both new supermarket construction and remodels brought about a 1.7% downturn in shipments of commercial refrigeration equipment in 1990 — the first downturn in a decade — according to the Commercial Refrigerator Manufacturers Association (CRMA).

The trade association does not report numerical totals for shipments or for the various equipment categories.

Based on the percentage changes supplied by CRMA, the Bureau of the Census, and other sources, *The News* estimates that shipments of refrigerated cases in 1990 totaled 100,900 units, down 1.4% from the previous year's total of 102,400 units. The difference between the percentages reflects the fact that the CRMA figure includes condensing units while ours does not.



CRMA reported that shipments of standard-temperature meat display and self-service cases were down 5% from the previous year's total. Within the group, self-service multideck shipments increased by 4.9%. The group accounts for about a quarter of all unit shipments.

Shipments of produce cases were up 2.7% in 1990, dairy case shipments were up 2.7%, and standard-temperature island-type case shipments increased by 6% last year.

Low-temperature display cases, which make up more than one-third of commercial refrigeration shipments, declined by 6% last year from 1989 levels. Within that group, single-level cases were down 13%, island-type freezers were down 6.5%, but multilevel open freezer cases increased by 9%.

CRMA reported that shipments of spot-type display freezers were down 4.9% and shipments of reach-in freezer display cases with glass doors dropped by 3.3%. Within the reach-in group, 2- and 4-door unit shipments edged slightly upward while the 3-door and 5-door or more shipments declined in the 4% to 5% range. The reach-in group accounts for about one-fifth of all case shipments.

The trade association no longer provides figures for walk-in cool-

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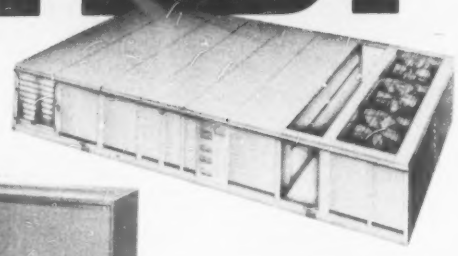

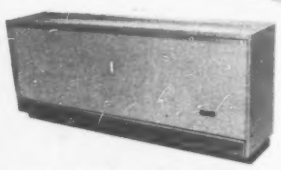

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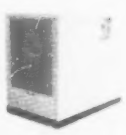

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Circle 34

*(Continued from Page 33)*

ers. It is, however, still considering the collection of unit shipment and dollar figures for display cases mostly sold to convenience stores.

Equipment included would be ice cream display cases and dipping cabinets, standard-temperature reach-ins with glass doors, deli/sandwich and bakery cases, and ice merchandisers. Again, however, it's likely that only percentage changes will be reported by CRMA.

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### CFCs

Supermarket owners, who for many years have used CFC-12 for medium-temperature cases and R-502 (a 50-50 azeotrope of HCFC-22 and CFC-115) for low-temperature systems, were among the first to be directly affected by amendments to the Clean Air Act.

The amendments require that CFC production be cut 15% (from 1986 production levels) this year and phased out completely by the year 2000. Additionally, a graduated tax ($1.37/lb this year for CFC-12 to $4.90/lb in 1999) adds to the urgency. The tax on R-502 is 47 cents/lb this year graduating to $1.47/lb in 1999.

Against this backdrop, supermarket owners are switching to HCFC-22 systems for both medium- and low-temperature applications. Because of its much lower alleged contribution to ozone layer destruction, HCFC-22 is not scheduled to be phased out until 2030. Because of the escalating taxes on CFCs, and experience indicating annual leakage rates of 25% to 50% of supermarket refrigeration charges, this trend certainly will accelerate.

The transition from CFC-12 to HCFC-22 for medium-temperature systems, aside from equipment changes, has been relatively uneventful. Operating costs are similar. But for low-temperature systems, there still is debate over system life and whether a simpler but riskier single-stage or a potentially more reliable and complex two-stage system is best.

It should be remembered that R-502 was developed because the high discharge temperatures of HCFC-22 had a habit of destroying compressors early in their life. The availability of skilled service technicians has been listed by some as a criterion for two-stage systems.

The result has been much experimenting with two-stage internally and externally compounded HCFC-22 systems, particularly in the South, and single-stage designs using floating head pressure controls, liquid injection, particularly in the North, as well as evaporative condensing, open drives, mechanical and ambient subcooling.

And although some refrigerant producers say HFC-134a (the projected replacement for CFC-12) now is commercially available, supermarket owners say they will not consider it until it's available from their local wholesalers.

Too, researchers report they have yet to find a reliable lubricant for HFC-134a in low-temperature applications. Research is just beginning on HFC-125 and a number of unspecified blends as possible replacements for R-502. Results are not expected for three or four years.

### Some perspective

In an earlier issue of *The News*, Tyler Refrigeration Co. marketing vice president Richard J. Dittoe provided some perspective on changes within the supermarket industry over the past decade. Following is a condensed version of those observations.

In the decade of the 1980s, supermarket operators began to remodel in earnest as chains and independents introduced new formats and others remodeled to stay competitive. As a result, refrigeration equipment (cases, compressor racks, walk-in coolers) increased at an annual compound rate of more than 5% in real terms from 1982 through 1988. Since 1988, equipment sales have been on a plateau but at a historically high level.

At the beginning of the 1980s, an average store used approximately 46 cases. Now, with superstores and combination stores growing in popularity, it's not uncommon to install 80 or more cases. Emphasis on produce and the creation of new perimeter service departments (hot food, chilled prepared food, fish, cheese, floral, bakery) and specialty boutiques also has increased case density.

Case density may stabilize during the 1990s, based on an apparent leveling in the size of stores constructed and remodeled. The growth of produce and special service departments, however, should continue in the 1990s.

The need for a new look to satisfy competitive pressures first was filled by European manufacturers with their lift-up curved-glass service cases. Domestic manufacturer responded with their own designs along with improved refrigeration. This trend, too, will extend into the 1990s.

Although energy savings diminished as a buying priority by the end of the 1980s, it's still an important factor. Compressor demand shifted from a majority of single-compressor racks to multiple compressor parallel racks. The industry has generally accepted the fact that uneven parallel racks are the most efficient. [*The News* believes that nearly half of 1990 condensing unit shipments were parallel multiple-compressor systems.]

During the 1980s, the sale of glass-door low-temperature cases increased steadily and will continue to dominate in the 1990s.

Available data indicates that new store construction is approximately 1,200 to 1,300 units per year. Major and minor remodeling activity affects another 2,500 to 3,000 stores each year. Remodels are expected to remain a high percentage of new equipment installations in the 1990s as supermarkets continue to remodel every four to seven years.

Elsewhere, *Progressive Grocer* reported that energy costs now range from 1.1% to 1.4% of sales. A survey indicated that, of total energy costs, refrigeration accounted for 50% to 59%, lighting for 23% to 31%, and heating and air conditioning from 4% to 8%.

One chain reported that its average energy cost was 5.96 cents/kWh/sq ft/month. Its newest store, equipped with a computerized control system for refrigeration, air conditioning, and lighting, recorded a cost of 4.23 cents/kWh/sq ft/month.

Many supermarket owners now forbid the venting of any refriger-

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## REFRIGERATION

ant on their premises. And a few have added leak-detecting refrigerant sniffers in their compressor rooms.

### Sales increase

Total sales of the nation's 30,750 supermarkets in 1989 amounted to $257.6 billion, an increase of 7.16% over the previous year, according to *Progressive Grocer*. The average compounded growth rate over the previous five years was 5.19%.

The Food Marketing Institute (FMI) reported that total sales for all of the nation's 147,000 grocery stores was $351 billion in 1989.

Of the total supermarket sales in 1989, frozen foods accounted for $15.597 billion (a 6.05% share), up 4.5%; meat $43.932 billion (a 17% share), up 7.2%; produce $24.469 billion (a 9.5% share), up 8.15%; dairy products $20.126 billion (a 7.8% share), up 5%; ice cream $15.597 billion (a 0.9% share), up

1.2%; and deli sales of $6.897 billion (a 2.68% share), up 12.8%.

A new competitive force now is bothering supermarket executives. The 400 wholesale clubs scattered across the land, with estimated sales of $24 billion in 1990, are expected by some to record sales of $100 billion in five years. They worry because food items account for about half of the sales total. Sales of perishables last year totaled $5 billion.

### Convenience stores

At the end of 1989, the nation's 83,000 convenience stores in the U.S. and Canada reported total sales of $93.2 billion, according to *Convenience Store News*. Of that total, in-store merchandise sales totaled $43.1 billion. The rest was petroleum products.

The magazine reported that annual sales of traditional convenience stores averaged $565,000 and that of petroleum marketers averaged $440,000 for in-store sales. The average customer spent $7.94 per visit at traditional stores and $8.44 per visit at petroleum outlets.

A survey conducted by the magazine revealed that 30% of traditional and 62% of petroleum operators plan to build new outlets, 24% of traditional and 44% of petroleum operators plan expansions, 24% of traditional and 30% of petroleum operators plan to expand food service, and 15% of traditional and 21% of petroleum operators plan to add food service facilities.

### Restaurants

A study conducted for the International Food Service Manufacturers Association (IFSMA) forecast that total sales for the nation's restaurants in 1991 will increase by 1.3% in real terms. The increase in 1990 was only 1.1%.

Tecnomic, Inc., who conducted the study, forecast that fast food restaurant sales will increase by 2.5% this year, compared to 3% in 1990, to $83 billion; full-service restaurant sales, which dropped 1.5% in 1990 and are due for no growth this year, total $67 billion excluding alcohol; and commercial cafeteria sales should increase this year by 1% to $4.85 billion.

Hotel restaurant sales, which dropped by 1% in 1990, should gain 0.5% in 1991. Employee feeding, up 2% in 1990, should increase by 1% in 1991 to $18.5 billion. Health care feeding, up 1.2% in 1990, should gain 0.9% this year to $11.65 billion. And feeding at colleges and universities should increase this year by 0.5% to $7.16 billion.

The National Restaurant Association (NRA) forecast that total sales in 1991 will total $248.13 billion, a 5.2% increase over the 1990 total of $235.78 billion. If inflation is deducted, however, the increase is only 0.6%.

Among the principal gainers in 1991 will be fast food restaurants and contract feeders. A major worry is the increase in the minimum wage in April to $4.25/hour.

A new market emerging among fast food restaurants is the conversion of franchises, particularly in the case of takeovers. Hardee's, for example, is converting 360 former Roy Rogers restaurants into Hardee's outlets. There are hundreds more conversions underway or planned.

A typical conversion costs about $200,000 for improvements and $200,000 for new equipment. A new outlet, on the other hand, averages about $750,000.

### Refrigerators

Home refrigerator shipments totaled 7,101,300 units in 1990, almost a dead heat with the 1989 total of 7,098,800 units, according to the Association of Home Appliance Manufacturers (AHAM).

In contrast, shipments of home freezers in 1990 totaled 1,296,000 units, an increase of 6.35% over the year-previous total of 1,218,600 units.

The 1990 breakdown shows 723,100 (or 55.8%) were chest-type freezers, up 6.7% over the 677,400 chest freezers shipped in 1989, and 572,900 (or 44.2%) were upright freezers, up 5.9% from the previous year's total of 541,200 upright freezers.

As with all of AHAM's public statistics, the figures include both products made in the United States, exports, and those imported from other nations.

### Unit coolers

Shipments of unit coolers, at 115,200 units in 1990, were down 18% from the previous year's total of 140,500 units.

It should be noted that the Bureau of the Census reported 176,423 unit coolers were shipped in 1989, the latest year for which these data are available. That represents an 11.6 decline from the 199,354 unit coolers the Bureau said were shipped in the previous year.

The industry figures do not include exports or the production of several significant manufacturers.

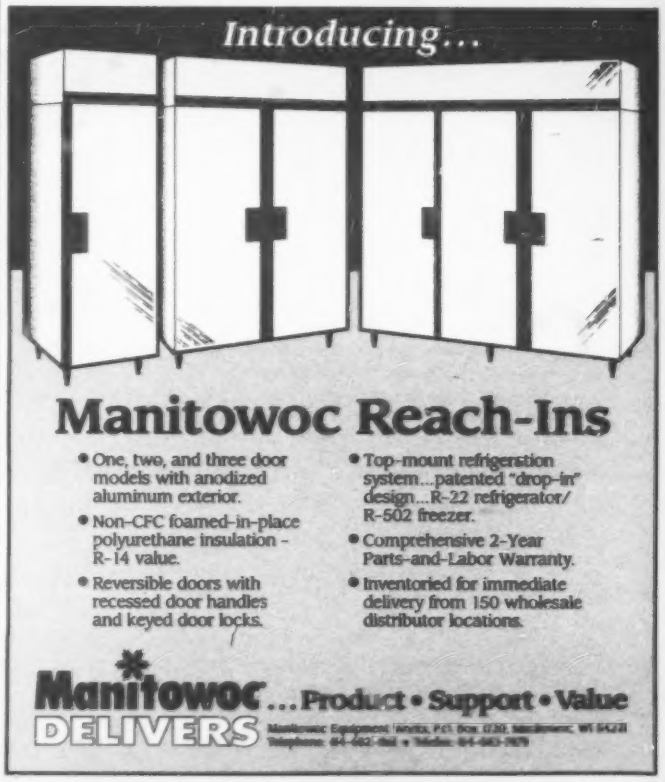
### Icemakers

Commercial icemaker shipments in 1990 totaled 229,600 units, a decline of 1% from the 1989 total of 231,900 units.

The Bureau of the Census reported that 189,770 commercial icemakers were shipped in 1989, the latest year for which these data are available. That represents a 22.1% decline from the revised 1988 total of 243,771 units.

Of the 1989 total, 73.3% were cubers, 27.5% were flakers, and 4.2% were other types.

*The News* cannot explain the difference between the two sets of numbers because both include domestic and export shipments. Some have suggested that the government numbers include small residential icemakers not included in the industry totals.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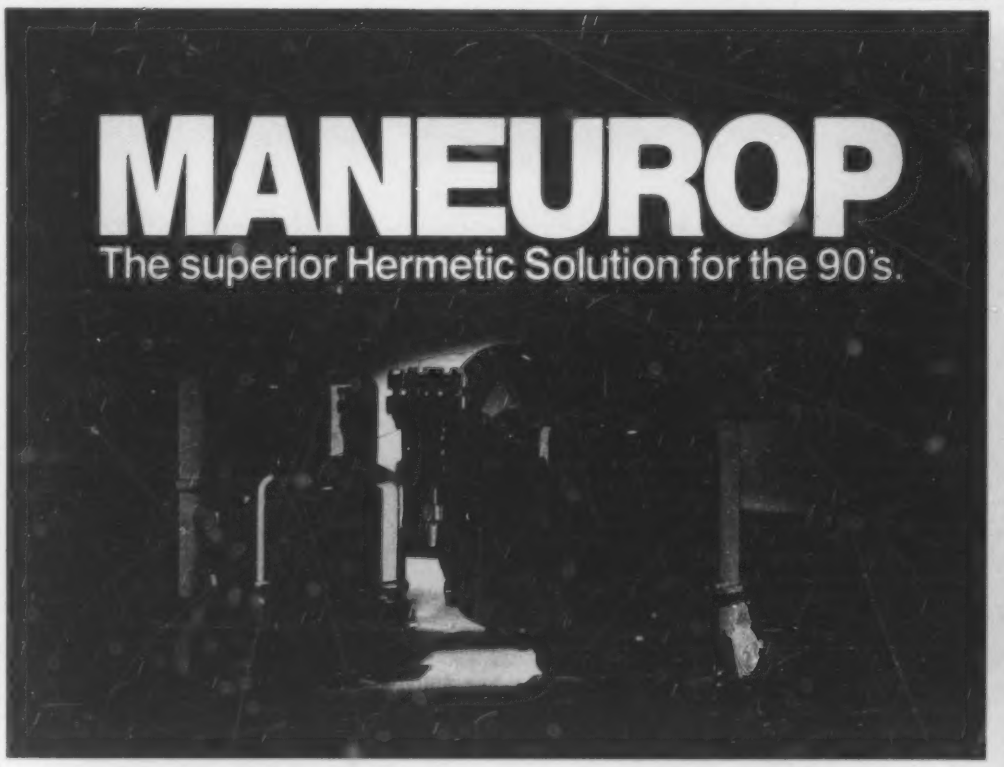
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Circle 31

Bureau of the Census data

## A 10-year look at air conditioning and refrigeration unit shipments

| Product | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia compressors | 1,660 | 1,809 | 1,503 | 1,173 | 1,233 | 1,140 | 1,252 | 1,886 | 1,189 | 2,089 |
| Screw compressors[1] | 5,609 | 5,320 | 2,920 | 3,691 | — | — | — | — | — | — |
| Central-station air handlers | 60,841 | 59,665 | 58,961 | 58,301 | 53,413 | 59,009 | 61,383 | 59,359 | 66,282 | 69,736 |
| Unitary air conditioners[4] | 1,861,465 | 1,991,507 | 1,599,838 | 2,097,152 | 2,448,677 | 3,419,663 | 3,699,330 | 3,947,919 | 4,100,173 | 4,283,186 |
| Packaged terminal air conditioners | 143,212 | 143,427 | 135,741 | 150,073 | 184,769 | 119,123 | 146,591 | 135,214 | 85,529 | 82,306 |
| Packaged terminal heat pumps[4] | — | 32,439 | 52,512 | 58,759 | 98,549 | 96,155 | 105,084 | 99,312 | 55,449 | 58,070 |
| Reciprocating chillers | 12,325 | 12,099 | 11,668 | 10,533 | 13,788 | 14,094 | 12,804 | 13,242 | 14,909 | 16,525 |
| Absorption chillers | 279 | 239 | 199 | 135 | 153 | 131 | — | 1,411 | 899 | 746 |
| Evaporative condensers | 2,881 | 2,859 | 2,168 | 2,149 | 2,426 | 2,505 | 2,282 | 2,382 | 2,182 | 2,284 |
| Mobile vehicle air conditioners | 5,852,329 | 6,099,342 | 5,651,329 | 9,267,612 | 12,196,385 | 13,008,516 | — | 9,752,154 | 13,474,629 | 14,130,367 |
| Recreational vehicle air conditioners[1] | 93,919 | 119,566 | 142,227 | 156,689 | 173,914 | 172,833 | 177,842 | — | 232,591 | 227,959 |
| Unit coolers | 175,371 | 169,487 | 163,697 | 187,612 | 179,726 | 205,282 | 196,301 | 200,296 | 199,354 | 176,423 |
| Dehumidifiers | 734,736 | 540,396 | 438,633 | 610,013 | 596,003 | 589,056 | 484,961 | 590,399 | — | — |
| Humidifiers (central and self-contained)[1] | 423,966 | 396,413 | 310,342 | 324,948 | 427,504 | 370,585 | 410,762 | 454,295 | 504,566 | 524,847 |

Source: Bureau of the Census, Current Industrial Reports MA-35M, Air-Conditioning and Refrigeration Equipment, Including Warm Air Furnaces. [1]New category since 1980. [2]Includes vertical stack units. [3]Withheld to avoid disclosing operations of individual companies. [4]For years 1980 through 1984, add these figures to those for unitary heat pumps (air-to-air) and subtract exports to get comparable industry figures. [5]Excludes open-type units. Also excludes units 200 hp and under and units 401 hp and over for 1988 and 1989.

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Although power humidifiers are known more as an existing home product, the relative stability of the Midwest's new and existing home markets and a thrust by an increasing number of merchandising contractors have helped to keep shipments spiraling upward since the 1982 recession. But, in 1990, that wasn't quite enough.

We believe that shipments of power humidifiers last year totaled 492,600 units, a decline of 14% from the 1989 total of 572,800 units.

In years past, industry executives reported that nine of 10 power humidifiers were installed in existing homes. Most of those installed in new homes came a year or two after occupancy.

In recent years, however, a growing number of merchandising contractors are quoting on humidifiers along with furnace or air conditioner replacements. This factor, together with the trend toward larger homes, has helped increase shipment levels in the face of declining new and existing home sales.

In 1990, however, a serious drop in consumer confidence, the war with Iraq, and a sagging economy proved to be too much of an obstacle. The early end to the war and the promise of a turnaround in the economy by mid-1991 should help consumer confidence and increased shipments of humidifiers as the next heating season approaches.

A survey conducted by *The News* in 1989 revealed that two-thirds of the contractor respondents said they always tried to sell a humidifier with a new furnace. More than a quarter said they installed 10 to 20 humidifiers in the previous year and another quarter said they installed from 20 to 40 units.

Of those installed, 18.7% went into new homes, 29.4% were first installations in existing homes, 34.7% were sold with replacement furnaces, and 17.2% replaced existing humidifiers. Three of four contractors said sales of portable humidifiers through retail outlets

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did not hurt them.

A fear that the power humidifier market would be limited by a growing number of tightly insulated homes has not materialized. Few super-insulated homes, which require ventilators or dehumidifiers to reduce the humidity levels produced by household activities, have been built. The remaining 100 million homes provide a solid market potential.

Manufacturers have been influenced, however, to produce units with smaller capacities for condominiums, town houses, and generally higher insulation values. Special units also have been developed for use with heat pumps.

For the record, the Bureau of the Census reported that 504,568 humidifiers were shipped in 1989, the latest year for which these data are available. That represents a 3.8% decline from the year-previous total of 524,847 units.

### Central station air handlers

Shipments of central station air handlers in 1990 totaled 46,600 units, a decline of 6% from the previous year's total of 49,550 air handlers.

For the record, the Bureau of the Census reported that 69,736 central station air handlers were shipped in 1989, the latest year for which these data are available. This represents a 5.2% increase over the revised total of 66,292 units shipped in the previous year.

Of the central station air handlers the Bureau said were shipped in 1989, draw-through units made up 87.5% and blow-through units made up the remaining 12.5%. Not included in the totals are heating and ventilating types.

### Electronic air cleaners

A serious case of consumer confidence blues would appear to have struck the electronic air cleaner (eac) market along with the fourth year in a row that housing starts have declined.

We believe that shipments of electronic air cleaners in 1990 totaled 162,200 units, down 19% from the previous year's total of 200,300 units.

The efforts of merchandising contractors and a growing awareness of indoor air quality apparently were not enough to spur eac sales. Another factor is that, as homeowners pay more for higher efficiencies, some tend to leave the purchase of accessories for another day.

A major eac producer, Honeywell, believes eac's represent a $500 million untapped market for contractors. With the U.S. saturation of eac's at only 5%, the company is in the midst of a five-year program to include an eac with every fourth furnace, central air conditioner, or heat pump installed.

Eac's have a special compatibility with heat pumps because of their ability to keep the indoor coil clean in winter when there is no condensate to remove airborne dust. They are also helpful in removing the short-lived radon daughters that characteristically attach themselves to dust parti-

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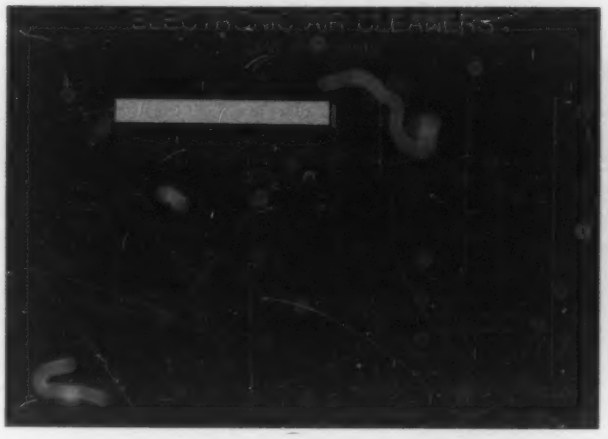

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cles. Eac's cannot, however, remove radon gas.

### Dehumidifiers

Shipments of dehumidifiers totaled a record 742,500 units in 1990, an increase of 22.7% over the previous year's total of 604,900 units, according to the Association of Home Appliance Manufacturers (AHAM). The industry shipped 704,000 units in 1987.

AHAM said the hurricane that swept the Southeast was the prime reason for the surge, although heavy rains and high water tables in the country's midsection also contributed.

### Refrigerants

U.S. shipments of the three most common refrigerants — CFC-11, CFC-12, and HCFC-22 -- totaled 649,680 pounds in 1990, a decline of 28.5% from the previous year's total of 908,187 pounds, according to the U.S. International Trade Commission.

Shipments of CFC-11 last year totaled 135,091 pounds, down 30% from the 193,249 pounds shipped in 1989.

Shipments of CFC-12 in 1990 totaled 208,524 pounds, a 45.8% drop from the 384,665 pounds shipped in the previous year.

Shipments of HCFC-22 (so designated because it is hydrogenated and mostly breaks down in the lower atmosphere) totaled 306,065 pounds in 1990, a decline of 7.3% from the 330,273-pound total recorded for 1989.

That's only part of the story.

As a follow-up to the 1987 Montreal Protocol (with world market impact) and the Environmental Protection Agency (EPA) regulations limiting CFC (chlorofluorocarbon) production, Congress enacted Title 7 of the Clean Air Act last year to accelerate the phaseout of CFCs and add HCFCs to the list of condemned refrigerants.

In keeping with the earlier regulations, Title 7 pegs maximum CFC production this year at 1986 levels. In 1991, CFC production cannot exceed 85% of that level. The limit is 80% in 1992, 75% in 1993, 65% in 1994, 50% in 1995, 40% in 1996, 15% in 1997 through 1999, and a complete phaseout of CFCs by the year 2000.

HCFCs were added to the list of refrigerants to be eliminated but the time span is longer. They cannot be used in new equipment designs — with the exception of residential and commercial air conditioning and refrigeration — beyond 2015 and, by Jan. 1, 2020, no new equipment using HCFCs may be manufactured. Existing equipment may continue using HCFCs until 2030, when production of the refrigerants will be terminated.

In a move that has little to do with environmental risk, Congress imposed a tax (based on relative ozone depletion factor) on Jan. 1, 1990, of $1.37/lb. The tax will escalate to $1.67/lb in 1992, $2.65 in 1993, $3.10/lb in 1995, and another 45 cents/lb each year thereafter. Not included in the tax plan is refrigerant reclaimed from existing systems.

Beginning in 1992, those who work with CFCs must take precautions to prevent the deliberate venting of CFCs. Rules that require the recycling of CFCs will be promulgated Jan. 1, 1992, and become effective the following July 1. EPA also is shaping a rule that will require, after July 1, 1992, hvac contractors and their technicians to be federally certified and to use an identification number to buy refrigerants.

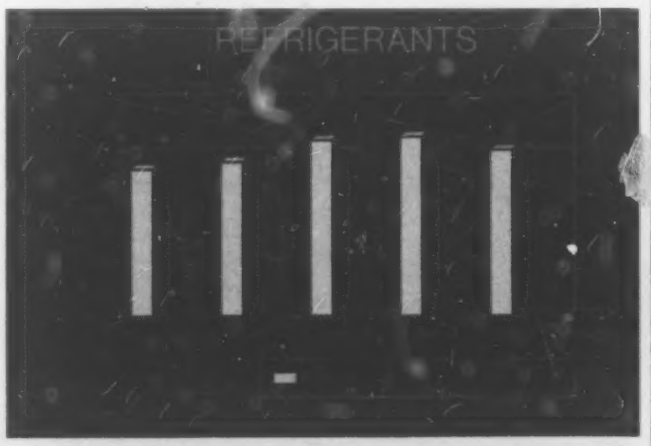
Although some claim the infrastructure to reclaim CFC refrigerants is in place, we doubt that it exists in many parts of the country. Testing costs, in the vicinity of $200 each, also are a factor. And the effect of reclaimed refrigerant on manufacturer warranties still has to be determined.

ARI Standard 700 is being accepted as the measure of refrigerant purity. However, many portable refrigerant reclaim units cannot meet that standard. An embryo certification program based on ARI Standard 740-91, "Performance of Refrigerant Recovery, Recycling, or Reclaim Equipment," may provide an answer.

The voluntary rating standard will spell out each machine's capability. It will be up to individual manufacturers to determine what standard of purity — and recovery equipment performance — they will accept for warranty work. Several already have opted for ARI Standard 700.

In 1990, commercial quantities of HFC-134a (a substitute candidate for CFC-12) and HCFC-123 (a substitute candidate for HFC-11) were available from several producers but not all of the required testing has been completed.

Chiller manufacturers report they are comfortable with HFC-134a, HCFC-123, and HCFC-22 as substitutes for CFC-11 and CFC-12 machines for air conditioning applications. Special chillers have been developed for the new refrigerants.

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# REPLACEMENT MARKET

For contractors, replacements provide the stabilizing force that enables them to shift emphasis with changing economic conditions. In 1990, with housing starts down for the fourth year in a row and both the economy and consumer confidence also down, growth in replacements was blunted for all but residential boilers and heat pumps.

Although substantial home heating equipment replacements have been a fact of life for many years, the relatively younger central air conditioner and heat pump markets are catching up, thanks to the 1.5 million to 2 million-unit annual shipments 12 to 15 years ago.

The drop in the total number of home comfort cooling replacements last ye[illegible] and the gain for heat pumps, probably is a direct result of utility incentives. Many make it only marginally more expensive to replace a worn-out or inefficient air conditioner with a heat pump and save on shoulder-season operating cost.

The decline in new construction activity, together with the now-proven proclivity of many homeowners to replace inefficient equipment in good working order with high-efficiency units, has changed the attitudes of many contractors. Those who once regarded service as a necessary nuisance now are putting increasing emphasis on this prime route to replacement s[illegible]

Contractors, wit[illegible]he help of a few manufacturers, also are exploring new (for them) marketing strategies to uncover even more potential customers from their own customer files and from purchased lists. Utilities also have become valuable allies in many areas with pron[illegible]n and rebates for high-efficiency equipment.

The percentage of residential replacements within shipment totals varies considerably. It ranges from nearly eight of 10 oil furnaces shipped last year to more than four of 10 heat pumps. More than half of residential cooling-only units shipped in 1990 were replacements.

### A macro view

Before examining individual industry markets, it's significant that national expenditures for residential alternations, repairs, and replacements have grown from $45.2 billion in 1982 to $100.89 billion in 1989. The real growth, in constant dollars, came in the period 1983 through 1986. It has since leveled off.

The National Association of Home Builders (NAHB) reported that, of the $60.8 billion spent in 1988 to remodel single-family homes, $27.6 billion was spent on homes built before 1960.

Heating and air conditioning alterations and repairs, at $7.46 billion in 1988, accounted for 7.4% of the total. It broke down into $2.751 billion for maintenance and repairs, $1.367 billion for additions and alterations, and $3.352 billion for major replacements such as furnaces, boilers, central air conditioners and heat pumps.

### Contractors do the work

Contractors are doing almost all of the heating and air conditioning work. In 1988, contractors did 93.8% of all jobs and, in only 0.5% of those jobs did the homeowner purchase equipment and materials. Only 5.7% of job value was handled by do-it-yourselfers.

There are many reasons for the increased interest in home improvements. The most obvious is that the nation's 100 million hous-

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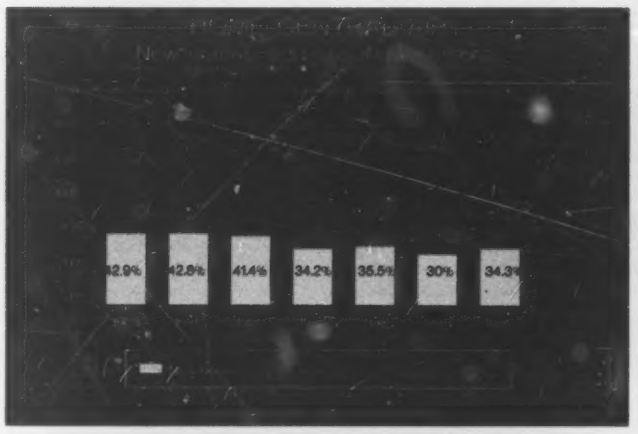


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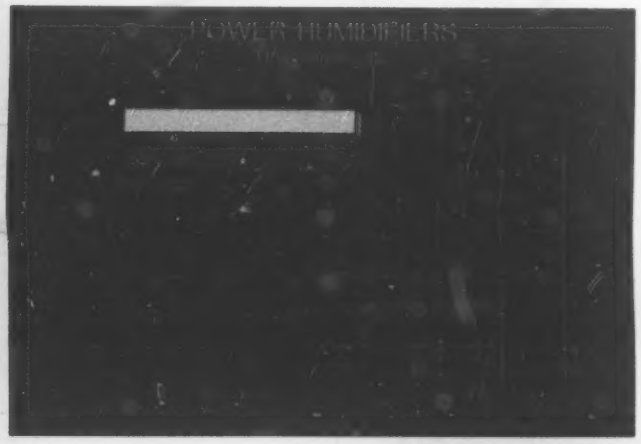


For freezer applications, it's a different story. Most supermarkets are switching from R-502 to either single- or two-stage CFC-22 systems. There are still questions about lubricants for HFC-134a. Polyol esters appear to work well in air conditioning and above-freezing applications but not with low temperatures.

The search goes on for a suitable low-temperature lubricant for HFC-134a. In the meantime, most are using HCFC-22 systems. And, although work continues on HCFC-124 as a replacement for CFC-114 in marine refrigeration, HCFC-125 as a possible replacement for R-502 in low-temperature applications, and a number of blends, the results are sketchy so far.

Because activity on all fronts is so volatile, it is best followed in the weekly issues of *The News*.

**Each *Statistical Panorama* includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.**


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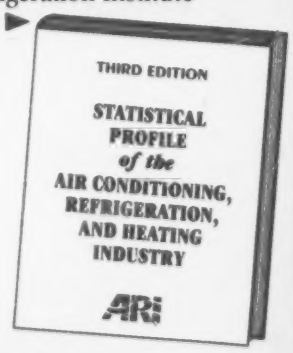


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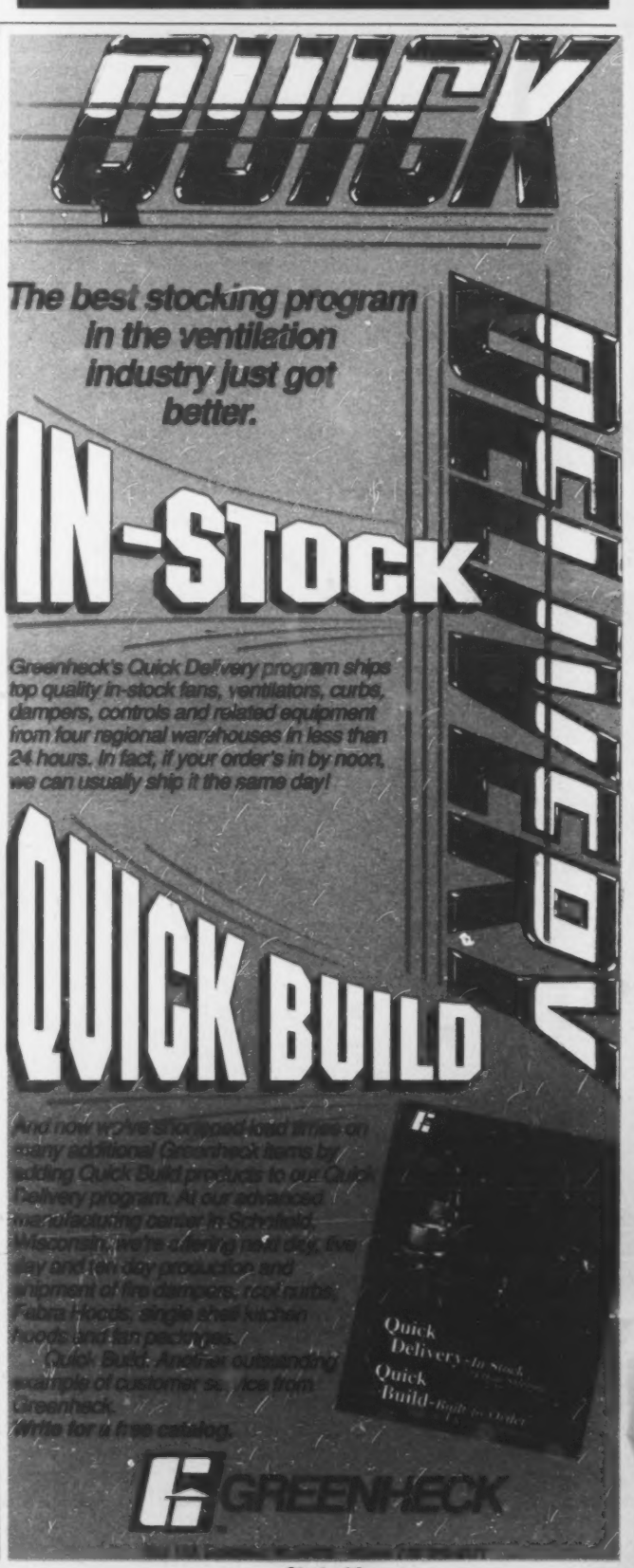
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Circle 22

# REPLACEMENT MARKET

*(Continued from Preceding Page)*

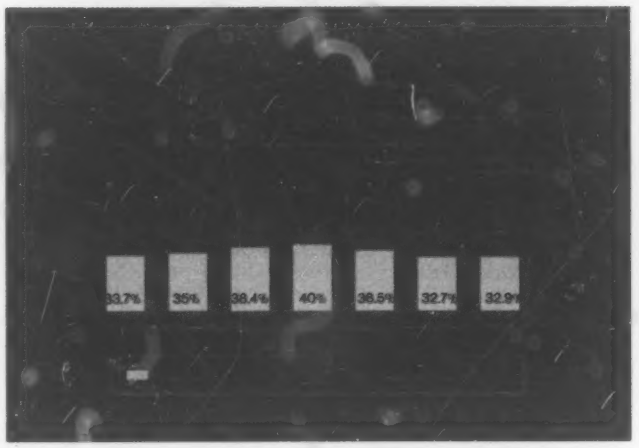
ing units (60 million single-family, 33 million multi-family, 6 million mobile homes) are aging. About a third were built before 1950 and are more than 40 years old. Only 36% of the housing stock was built since 1970.

Affordability problems, particularly in the Northeast and parts of the West, are forcing many to buy existing rather than new homes. And, with the purchase, comes the urge to upgrade or add missing amenities, usually within five years of the purchase.

For easier understanding and better accuracy, the replacement market for unitary air conditioning should be separated into four parts: residential and commercial comfort cooling and residential and commercial heat pumps.

If we subtract 808,655 from the 1990 total of 3,728,700 unitary air conditioners, we get 2,920,045 comfort cooling units, of which 85% or 2,482,000 were residential and 15% or 438,000 were commercial units.

The residential-commercial split was selected because it matched the latest determination of the Air-Conditioning and Refrigeration Institute (ARI). If you're comparing this split with the one found in the Air Conditioning section, remember that this one does not include heat pumps.




Of the 2,482,000 residential cooling units shipped in 1990, we estimate that 853,100 went into new construction (683,100 into single-family homes and 170,000 into multi-family units). These figures are arrived at by multiplying the penetration rate for central air conditioners (less the heat pump penetration rate) by the known number of housing starts.

The new single-family air conditioning and heat pump totals were increased by 20% in 1988, 25% in 1989, and by 21% in 1990 to reflect the extra units going into larger homes to accomplish zoning. And, of that portion, we estimate that 2.4 units went into 1989 homes and 2.1 units went into 1990 homes.

These figures reflect both the heavy trade-up emphasis in today's single-family market and the increasing size of these homes. The drop in 1990 reflects, in large part, the building decline in the Northeast.

Looking back at the air conditioners used in new homes in 1990 at 853,100, we find a 4.4% decline from the 892,300 units used in new homes in 1989. The numbers do not reflect the 10.8% drop in single-family or 20% drop in multi-family home construction because of the increase in air conditioning penetration to 77%.

Replacement residential central air conditioners in 1990 totaled 1,285,400 units, or 51.8% of residential cooling-only shipments. This represents a decline of 17.5% from the 1989 total of 1,558,700 replacements, partly because of the dip in consumer confidence and partly due to indirect utility incentives.

Add-on or modernization units for homes not previously cooled with a central system enjoyed the lion's share of the market in the 1960s and 1970s. The percentage dropped to about 12% in the 1980s but the hot summers of 1987 and 1988, plus utility efficiency incentives, increased the share to 15% in those two years.

We estimate that 350,400 u[illegible] were ad-ons in 1990, down 2[illegible] from the add-on total of 445 [illegible] the previous year. Last year's total, about 14% of cooling-only residential shipments, is being held up in part by the replacement of evaporative cooling units in the Southwest and the purchase of existing homes in the Northeast.

**Contractors are doing almost all of the heating and air conditioning work. In 1988, contractors did 93.8% of all jobs and, in only 0.5% of those jobs did the homeowners purchase equipment and materials. Only 5.7% of job value was handled by do-it-yourselfers.**

It must be remembered that central air conditioners have been installed in more than 30 million U.S. homes. Of these, more than 2.2 million each year cross into the prime 12- to 15-year-old prime replacement category.

### Commercial

Of the 438,000 commercial unitary comfort cooling units shipped last year (down 16.3% from the 523,350-unit total for 1989), we estimate that 217,350 units, or 45%, were replacements. The remaining 220,650 units went into new construction.

As late as 1985, we estimated that 70% of commercial unitary air conditioners went into new construction. Although there are no firm benchmarks, we estimate that the replacement segment has been growing steadily.

### Heat pumps

Of the 808,655 air-to-air heat pumps shipped last year, we estimate that 687,350 (85%) were residential units. Of these, 386,950 went into new site-built homes (309,350 into single-family homes and 77,600 into multi-family units) and 33,200 went into mobile homes.

Heat pump replacements and add-ons in 1990 totaled 286,200 units, an increase of 14.7% over the 249,500 units that went into those markets in 1989.

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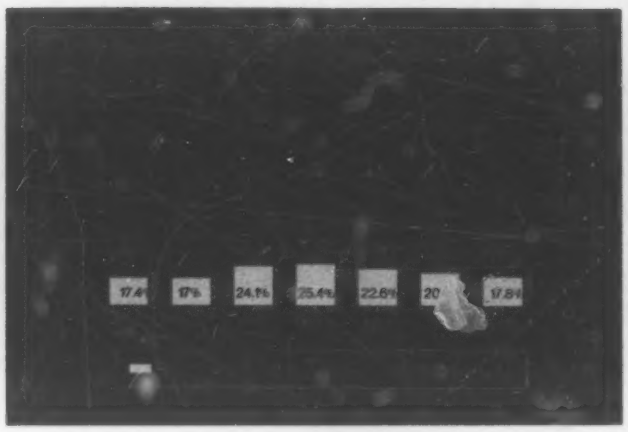
## REPLACEMENT MARKET

housing market in the South, the prime market for heat pumps, has been costly, we suspect that utility efficiency incentives have brought some new strength. Because the incentives sharply reduce the premium paid for heat pumps over straight cooling units, we suspect that many are replacing worn out or inefficient cooling units with heat pumps in order to save on operating costs in the spring and fall.

The replacement drive also has been helped by the increases in heat pump efficiencies and the fact that nearly half a million heat pumps arrive at prime replacement age each year.



### Furnaces

Of the 1,950,465 residential gas furnaces shipped in 1990, we estimate that 641,100 (32.8%) went into new single- and multi-family homes, 220,000 were conversions from other fuels, and 1,089,300 (55.8%) were replacements. This represents an 11.5% decline from the revised replacement total for 1989 of 1,231,700 units.

The American Gas Association (AGA) has provided figures for conversions from other fuels (see chart) that have significantly changed the replacement figures for 1990 and preceding years. These corrections have been made in the gas furnace replacement chart.

An entirely new market — replacements of furnaces in good operating condition for reasons of efficiency — has grown up in recent years. This market, which represents about 25% of annual shipments, has flattened over the last three years.

Of the 138,435 residential oil furnaces shipped in 1990, we estimate that 16,200 (11.7%) went into new single- and multi-family homes, 15,500 were conversions from other fuels, and 107,755 (77.8%) were replacements.

The performance of oil furnace replacements last year represented a 21% drop from the 136,480 replacement oil furnaces shipped in 1989. Again, the prime reason was the decline in housing activity in the Northeast, oil's prime market. New home starts in the Northeast have dropped 38% in the last four years.

It might also be noted that there were 190,000 replacement oil burners sold in 1990. Although this represents a decline of 14.8% from the 1989 total of 223,000 replacement burners, it still represents a substantial market for contractors.

### Boilers

Of the 328,737 residential boilers shipped in 1990, we estimate that only 58,600 (17.8%) went into new single- and multi-family homes and 14,500 were conversions to oil from other fuels.

The other 255,600 boilers, or 77.8% of the total, were replacements. That represents a 5.5% increase over the 242,300 replacements shipped in 1989. The reason, we believe, is twofold. One is the spike in oil prices as a result of the war with Iraq. And the other involves the steep home price increases in the Northeast which has caused many to buy an existing home and fix it up.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# HOUSING AND CONSTRUCTION

Consumer confidence lowered by a faltering economy and the uncertainties of the war with Iraq, a tightening of the availability and prerequisites for builder production loans, and a sharp drop in family formations all spelled a decline in basic demand for new homes. That was the 1990 scenario.

Total private housing starts in 1990 amounted to 1,193,100 units, down 13.3% from the 1,376,100 units started in the previous year. Last year's total was the latest in a steady decline of more than 600,000 housing units since 1986 and is the lowest total since the 1982 recession.

Single-family home starts, which continue to contain a strong trade-up segment, totaled 894,800 units in 1990. That was 10.8% lower than the 1989 total of 1,003,300 units and the first year since 1982 that single-family home construction has fallen below 1 million units a year.

Multi-family starts in 1990 totaled 298,300 units, a decline of 20% from the year-previous total of 372,800 units. This market sector, which produced more than 600,000 units as late as 1986, was first hit by pre-tax reform overbuilding and, for the last 18 months, by tight credit and a slowdown in family formations.

Again in 1990, declines were registered in all four regions.

Housing starts in the Northeast, at 131,100 units in 1990, were 26.6% less than the 178,500 total for 1989. Last year's drop followed a 24% decline in 1989 as the regional economy ran out of steam, steep home price increases peaked and then declined, and sellers and potential buyers found themselves in a virtual gridlock.

New home construction in the West, at 328,900 units last year, was down 16.8% from the 1989 total of 395,700 units. The South, at 479,700 units in 1990, was down 10.5% from the previous year's total of 536,200 units.

The smallest decline, at 4.7%, was in the Midwest. Total new home starts in that region last year amounted to 253,400 units, down from 265,800 units in 1989. This market, which suffered earlier troubles in the agricultural and manufacturing industries, has consistently produced more than 250,000 housing units a year since 1985.

In 1990, the Northeast accounted for 11% of total new housing production, the Midwest 21.2%, the South 40.2%, and the West 27.6%. It's interesting to note that, while housing construction inside metropolitan centers declined by 37% since 1986, construction in rural areas declined by only 5.2%.

### A supply problem

Although there appears to be no shortage of mortgage funds for home buyers, the wake of the thrift institution debacle has brought about an unprecedented supply-side credit crunch that, as it spreads to commercial banks, promises to get even worse in 1991.

As of mid-1990, the number of thrift institutions had shrunk from 2,945 before reform to 2,445. More than 490 thrifts were taken over by the Resolution Trust Corp. Some were merged or sold to other thrifts or commercial banks, some were dismantled, and 220 remain under RTC conservatorship or receivership.

Not only did this disrupt many builder-thrift relationships, but the share of residential acquisition-development-construction (ADC) loans to builders declined from 28% in the first quarter of 1989 to 13% at the same time a year later. This trend has continued.

The thrift share of residential mortgage loan originations also declined over the same time period from 50% to 32%. In the multi-family sector, however, the decline was from 55% to 28%. Commercial banks picked up much of the mortgage loan originations but, for multi-family builders, the banks were not as cooperative for either ADC loans or mortgages.

Commercial banks, after a warning letter from the Office of the Comptroller of Currency about fundamental deficiencies in bank real estate lending, together with heightened scrutiny by examiners, have become much more conserva-

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## HOUSING AND CONSTRUCTION

tive about multi-family project loans.

Thrift-related minimum capitalization regulations and limits on loans to one borrower have severely impacted builders applying for ADC loans, according to the National Association of Home Builders (NAHB).

And Treasury Department proposals for commercial bank reform would extend the ban on direct equity investments in real estate from national to state banks. It would also add an interest rate risk component that could weigh heavily against such long-term fixed-rate assets as home mortgages.

### 1991 forecast

Although much of the home construction news was dismal in 1990, there still are some bright spots. Mortgage interest rates dropped into the 9% to 9.5% range yet, because of other fears, potential home buyers sat on their hands.

But, with the early end to the war with Iraq and the prospect that world oil supplies will not be seriously disrupted, the hope is that the recession will be shallow and short-lived.

Even if the economy picks up by the third quarter of this year, it is not expected to materially help overall housing starts this year. The comfort is that 1991 should produce the bottom of the current cycle and that we can look forward to modest increases in 1992 and 1993.

All of this means that housing starts probably will shrink again this year to about 1,080,000 units, down 9.5% from 1990 levels. The breakdown is for 825,000 single-family units, down 7.8%, and 255,000 multi-family units, down 15%. This, we might add, is in line with the NAHB forecast, which has enjoyed an excellent track record in recent years.

NAHB also expects starts will climb to 1,253,000 units in 1992 and to 1,420,000 units in 1993 — a reflection of confidence that the artificial restraints on multi-family construction will be lifted by that time.

### The top 20

In listing the top 20 residential construction markets for the first 10 months of 1990, as compiled by NAHB, we are reminded that many of the totals — particularly in the top tier — are only about half of the full-year figures for 1989. The top 20 metropolitan areas, together with the number of building permits pulled in the first 10 months of last year, follow:

Riverside-San Bernardino, Calif. 21,640; Atlanta 17,880; Washington, D.C. 14,470; Sacramento, Calif. 12,760; Minneapolis-St. Paul 10,430; Detroit 10,130; Orlando 10,100; Phoenix 9,740; Las Vegas 9,680; Chicago 9,530; Seattle 9,130; Dallas 8,750; Philadelphia 8,720; Baltimore 8,520; Los Angeles-Long Beach 8,120; Houston 8,030; Tampa-St. Petersburg 6,970; Charlotte-Gastonia 6,900; St Louis 6,550; and San Diego 6,030.

The multi-family start leaders were: Los Angeles-Long Beach 14,480; Seattle 11,750; Las Vegas 8,950; San Diego 8,120; Washington, D.C. 7,750; Anaheim-Santa Ana, Calif. 6,870; Orlando 6,590; Chicago 5,680; New York 5,380; Miami 5,320; Portland, Ore. 5,300; Atlanta 5,130; Ft. Lauderdale-Hollywood 4,860; Dallas 4,850; Tampa-St Petersburg 4,490; Detroit 4,380; Milwaukee 3,890; Columbus, Ohio 3,580; Naples, Fla. 3,450; and Baltimore 3,340.

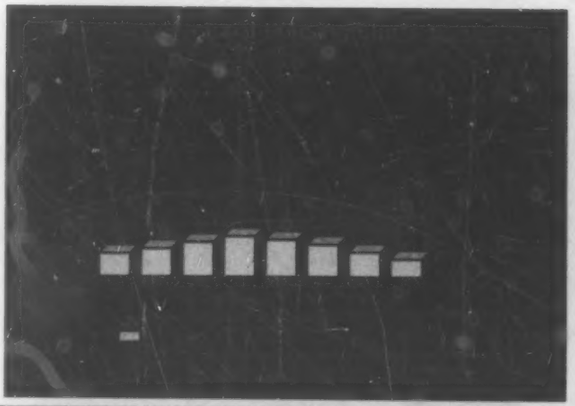
### Interest rates

Interest rates for fixed-rate mortgages held in the 10.75% to 10.5% range from 1987 until late in 1990. In the period from November 1990, until March 1991, interest rates dropped until, with some banks, they dipped a hair below 9%. In mid-March, however, they inched upward but are not expected to rise much above 9.75% for at least a year.

Adjustable-rate mortgages (ARMs), which enjoyed a 61% share of the total in 1984 when fixed-rate instruments were above 14%, also held at about 9.4% until late in 1990 when they dropped below 8%. The share of ARMs in October 1990, was 30% of the residential mortgage market.

New capital rules have severely weakened incentives by thrifts

*(Next Page, Please)*

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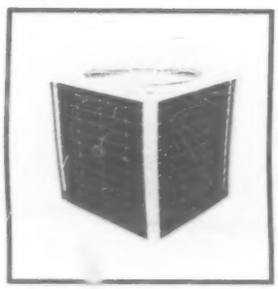

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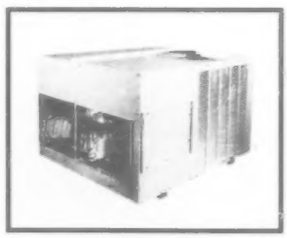

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Circle 24

# HOUSING AND CONSTRUCTION

*(Continued from Preceding Page)*
to initiate deep-teaser ARMs that offer a wide spread from fixed-rate mortgages for the first few years. Because these deep-discounted ARMs are not eligible for mortgage insurance or as collateral for mortgage-backed securities, it's expected that their future success will be determined by market forces and not the pricing policies of thrifts.

On the horizon is a fear that the huge federal deficit, brought about in part by the thrift failures and expenses related to the war with Iraq, will require heavy federal borrowing. And because capital from abroad will be required, it's likely that interest rates generally will have to be raised to attract that foreign capital.

### Demographics

It appears clear that aging baby boomers will continue to dominate the demand for new homes for several more years. The existing supply of trade-up homes will not be enough to meet the needs of the leading edge of the baby boomers, those between 35 and 44 years old.

They will leave behind them an oversupply of starter homes for the baby bust generation coming behind. This doesn't mean there will be a crash in the value of starter homes, but it probably means that they will appreciate at a lower rate than the more expensive dwellings.

The number of households with people in the 55- to 74-year-old age bracket will remain relatively stable. Net immigration probably will account for a third of the nation's population increase.

With removals from the housing stock and a reduced but still viable demand for second homes, NAHB expects there is enough demand to support an average of 1.3 million to 1.4 million housing starts a year into the foreseeable future.

It is significant, however, that the baby bust generation will have a negative impact on multi-family starts. In both the 1990-1993 and 1993-1996 periods there will be a drop of at least 5% in the 20- to 24-year and 25- to 29-year age groups — the slices of population most interested in apartments.

This factor was demonstrated in 1990 when, despite recession-type construction rates, the 7.2% vacancy rate for all rental units was only slightly lower than the 7.6% rate a year earlier. For buildings with more than five units, the vacancy rate declined only from 10.3% to 9.5% in the same period.

NAHB estimates that the number of new homes that serve initially as second homes (they tend to be converted later in their lives to primary homes) is probably about 100,000 a year. Excluding timeshares, less than 4% of households own second homes and they tend to be owned by middle-aged married couples. About 25% of vacation/recreation second homes are mortgaged versus 58% of owner-occupied homes.

New single-family homes are getting bigger and have more amenities. The average size of 1,555 sq ft in 1972 gave way to 1,720 sq ft in 1981 and, in 1988, it was 1,995 sq ft as the trade-up phenomenon came into full bloom. Central air conditioning was installed in 43% of new homes built in 1972 — and in 75% of those built in 1988.

The median size of new apartments built in 1989 was 940 sq ft. Units with two or more bedrooms stood at 62% in that year and units with two or more bathrooms stood at 41%.

The median price of a new home sold in October 1990, was $121,800, down from $123,000 at the same time a year earlier. Interestingly, the average price in October 1990, was $157,500, up substantially from $147,800 a year earlier, according to the Bureau of the Census.

The median price of existing homes sold in October 1990, was $92,800, almost the same as the $92,400 recorded in the same month of 1989, according to the National Association of Realtors. The average price for the same time frame was $115,700 for 1990, and $116,700 for 1989.

Of the 895,000 single-family homes started last year, 530,000 (59%) were built by contractors for sale, 197,000 (22%) were built by contractors on the owner's land, 147,000 (16%) were built by the owners, and 21,000 (2%) were built for rental.

Of the 298,000 multi-family units started last year, 56,000 (18.8%) were for sale and 242,000 (81.2%) were rental units. In 1983, for-sale units amounted to 210,000 units and, in 1985, 515,000 rental units were started.

Information from the Office of Thrift Supervision compiled by NHAB reveals the decline in new and existing home prices in the Northeast, a factor that is severely hampering that market. Those interested in upgrading cannot because they can't sell the house they're living in. And everybody is holding out for the high prices they expected from a rapidly escalating market.

In 1988, the average sales price of a home in Boston was $190,300. In the third quarter of 1990, it was $169,600. In Philadelphia the average price fell from $142,700 to $130,200 in the same time frame. But, in New York, the average climbed from $195,100 to $198,600.

NAHB estimated the volume of new home sales in 1990 at 540,000 units, down 16.8% from 649,000 sales in 1989. Similarly, the National Association of Realtors forecast that 3,326,000 existing homes were sold in 1990, down 3.3% from the 1989 total of 3,440,000 existing homes sold.

### Mobile homes

Manufacturer shipments of mobile homes totaled 192,300 units in 1990, down 5.2% from the 202,800 mobile homes shipped in the previous year, according to the Bureau of the Census.

Shipments of these site-delivered homes, popular with retired people and those with moderate incomes, are not counted in the official housing statistics.

For the past five years, mobile homes have accounted for about 20% of private single-family homes, down from 26% in 1985. In 1990, it was 21.5%. But they accounted for 36% of single-family home starts in recession-ridden 1982.

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Although imports of air conditioning and refrigeration equipment and components into the United States increased by 20% last year, a 22.5% increase in the larger export base again increased the industry's positive trade balance. Still, however, it was nearly $800 million short of the $1.8 billion trade surplus recorded a decade ago.

Almost half of the 1990 imports were in two categories — $836 million worth of compressors and $233 million worth of room air conditioners. These imports were offset, in part, by U.S. export compressors worth $399 million and $110 million worth of room unit exports.

According to the Department of Commerce, U.S. exports of refrigeration and air conditioning equipment and components in 1990 totaled $3,265,359,000, or 22.5% more than the 1989 total of $2,664,792,000.

U.S. imports last year totaled $2,302,637,000, an increase of 20% over the 1989 total of $1,918,719,000. The positive balance of trade, at $962,722,000, was up 29% from the year-previous positive trade balance of $746,073,000.

Imports last year represented 70.5% of exports, down from 72% in 1989 but on a par with the ratio recorded in 1988. In 1981, total imports of $273.8 million represented only 13.2% of exports.

Although still substantial, imports of compressors were down a bit in 1990. The total of 11.5 million refrigeration and air conditioning compressors imported last year was down 6.5% from the 1989 total of 12.3 million. If the 4.4 million auto air conditioning compressors are added to the 1990 total, the number of all types of compressors totals 15.9 million, down 7% from 17.1 million in 1989.

Imports of room air conditioners in 1990, at 897,284 units, was up only slightly from the previous year's total of 895,136 units. The peak was in 1988 when 1,087,875 room units were imported. Room unit imports in 1983 totaled 98,000 units. Exports of room units in 1990 totaled 302,530 units.

There are many reasons for the

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Circle 56

# INTERNATIONAL

continued increases in imported equipment and components. In addition to foreign companies seeking to initiate or expand U.S. market opportunities, two U.S. compressor manufacturers and a pair of room unit manufacturers have moved all or part of their production offshore so they can better compete in world markets.

Although the value of the dollar in relation to major world currencies continues to fluctuate, it remains as a positive force. It has had some effect on the Japanese, who are building two compressor plants in the U.S. The Japanese share of U.S. imports has declined from 49% in 1987, 45% in 1989, and 39.7% last year.

### Free trade

The U.S. and Canada are in the third year of a 1988 free trade agreement that, over a 10-year period, will remove tariffs on air conditioning, heating, and refrigeration equipment. Canada continues to be the best customer for U.S. exports. Increased trade between the two countries is illustrated in 1990 by significant increases in both imports and exports.

In 1990, imports from Canada into the U.S. totaled $220.9 million, up from $72.5 million in 1988. During the same time span, U.S. exports to Canada grew from $578 million in 1988 to $929 million last year.

It must be remembered that these figures only represent shipments. They do not take into account the profits of U.S. companies not reinvested abroad, coming from subsidiaries, joint ventures, and licensing agreements.

### Major markets

A look at major export markets would not be complete without an advance look at the European Economic Community's (EEC's) plans to remove all tariff and nontariff barriers to trade within the 12-nation group next year.

Although the details still are far from complete, the plan promises to open up the European market to free trade. Many U.S. companies have been established in Europe for many years and U.S. trade associations and technical societies are cooperating on the development of testing and rating standards that could be adopted by the EEC.

The prospect of easier trading in Western Europe has been given an added boost by the unification of Germany and the independence of many nations in Eastern Europe that formerly were controlled by the Soviets. As a result, many U.S. companies have been setting up marketing arrangements in these countries.

Although not expected to develop overnight, markets in Eastern Europe are expected to develop exponentially over the next five years. The problem is not need. It is the means of payment that will take time to develop.

And even though shipments to the Middle East still were substantial in 1990, there is no doubt that the war with Iraq disrupted markets in the last half of the year. The early conclusion of that war, however, promises even higher shipments in the near term as life there gets back to normal and the rebuilding of Kuwait begins.

There were significant changes in regional shares of the U.S. export market.

Canada, for the eighth year in a row, was the leading export market for U.S. products. The 1990 total of $929 million, up from $650 million a year earlier, restored Canada to the 28% share of the world market it enjoyed in 1988. It had slipped to a 24% share in 1989.

Markets in Central and South

*(Next Page, Please)*

## Major export markets

**U.S. air conditioning, refrigeration equipment (values in millions)**

| Market | — 1986 — | | — 1987 — | | — 1988 — | | — 1989 — | | — 1990 — | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Value | % of total | Value | % of total | Value | % of total | Value | % of total | Value | % of total |
| Canada | 459 | 34 | 556 | 34 | 578 | 28 | 650 | 24 | 929 | 28 |
| Central, South America | 234 | 18 | 264 | 16 | 305 | 15 | 376 | 14 | 608 | 19 |
| Western Europe | 251 | 19 | 287 | 18 | 401 | 19 | 529 | 20 | 596 | 18 |
| Far East | 217 | 16 | 297 | 18 | 508 | 24 | 792 | 30 | 776 | 24 |
| Middle East | 140 | 11 | 174 | 11 | 253 | 12 | 256 | 10 | 278 | 9 |
| Africa | 28 | 2 | 37 | 2 | 48 | 2 | 57 | 2 | 67 | 2 |
| Other | 2 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 9 | 0 |
| Total | 1,331 | 100 | 1,615 | 100 | 2,093 | 100 | 2,660 | 100 | 3,265 | 100 |

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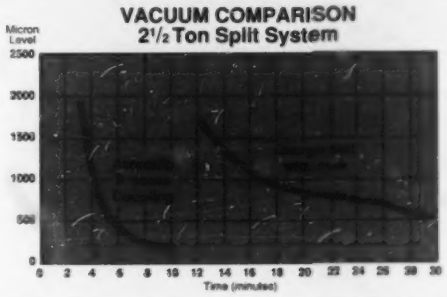


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**Circle 60**

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**Circle 61**

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KA18

# INTERNATIONAL

*(Continued from Preceding Page)*
America increased dramatically in 1990. Last year's total of $608 million overshadowed the 1989 total of $376 million and the world market share for the region increased from 14% to 19%.

Although exports to Western Europe increased from $529 million in 1989 to $596 million last year, its share of the world market slipped from 20% to 18%. Exports to the Far East, at $778 million last year, were down from $792 million in 1989 and market share dropped from 30% to 24% in 1990.

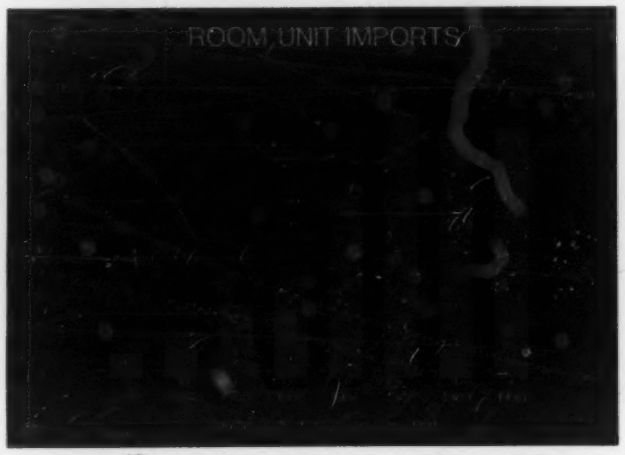
The Middle East, the leading export market for many years, was directly affected by the war with Iraq during the last half of the year. Even so, exports to that region grew from $256 million in 1989 to $278 million last year while world market share dropped from 10% to 9%. Both exports and market share are expected to grow during the next few years with reconstruction and normal expansion.

Africa, with a 2% share in both years, received nearly $67 million in U.S. exports last year. The "other" category, which largely includes Eastern Europe, could develop into a separate category in the years to come as the wave of independence in the region blossoms. The demand is there but the cash has yet to come.

### Exports

In terms of products exported from the United States, the Department of Commerce prepares a country-by-country breakdown for most of the product categories contained in the SIC 3585 classification. Although we do not have the space to list the complete breakdown, a feel for the top export markets in 1990 can be gained by looking for key products and top customer countries.

The following breakdown provides the 1990 total for each category and the total for 1989 in parentheses where available.




**Compressors of 3 hp or less** — 1,440,485 units (1,771,901 in 1989); Mexico 156,719; Japan 133,160; S. Korea 109,807; Brazil 105,352; Israel 64,777; Egypt 28,680; France 23,727; Canada 23,016; Colombia 12,014; Argentina 5,889; and Kuwait 5,554.

**Compressors from 3 to 10 hp** — 171,725 units (204,444 in 1989); Thailand 37,417; S. Korea 24,241; Venezuela 12,427; Malaysia 11,804; Brazil 11,474; Taiwan 7,890; Kuwait 6,737; Mexico 6,509; Singapore 4,298; and Nigeria 3,169.

**Compressors over 10 hp** — 149,186 units (32,454 in 1989); Canada 112,817; France 6,840; China 4,200; S. Korea 3,037; Thailand 2,343; Britain 1,984; Taiwan 1,839; Malaysia 1,740; and Mexico 1,668.

**Screw compressors** — 4,061 units (9,124 in 1989); Mexico 2,256; Jamaica 526; Thailand 293; Colombia 227; and Canada 117.

**Ammonia compressors** — 89,278 units (9,416 in 1989); Canada 85,833; Israel 748; S. Korea 701; and Thailand 314.

**Auto and truck refrigeration and air conditioning compressors** — 203,652 units (272,408 in 1989); Mexico 63,950; Italy 29,737; Canada 22,645; Japan 13,495; Argentina 11,859; S. Korea 10,529; France 10,059; Germany 7,382; Hong Kong 4,288; and Britain 3,561.

**Parts for refrigeration and air conditioning compressors** — $77,309,000 ($70,017,000 in 1989); Canada $21,554,000; Mexico $10,877,000; Belgium $9,273,000; France $7,948,000; India $2,190,000; Argentina $2,062,000; Australia $1,886,000; and Japan $1,694,000.

**Room air conditioners under 10,000 Btuh** — 126,482 units (163,919 in 1989); Taiwan 31,577; Canada 26,881; Mexico 20,671; Belgium 7,617; Panama 3,828; Germany 3,347; Israel 3,211; Spain 2,590; Bahamas 1,840; and Sweden 1,773.

**Room air conditioners from 10,000 Btuh to 17,000 Btuh** — 87,062 units (133,162 in 1989); Taiwan 52,498; Mexico 8,672; Canada 4,550; Hong Kong 2,580; Nigeria 1,347; Spain 1,302; Saudi Arabia 1,164; and Panama 1,049.

**Room air conditioners over 17,000 Btuh** — 88,986 units (115,564 in 1989); Taiwan 32,002; Mexico 12,268; Canada 5,815; Britain 4,930; Sudan 4,329; Hong Kong 3,443; Kuwait 2,872; Ghana 2,719; Saudi Arabia 2,589; S. Korea 1,650; Panama 1,630; Bahrain 1,549; and Nigeria 1,447.

**Self-contained heat pumps** — 73,463 units (54,201 in 1989); Turkey 19,073; Germany 14,228; Mexico 12,268; Canada 9,068; United Arab Emirates 4,874; Chile 3,555; Saudi Arabia 3,258; Morocco 3,114; Lebanon 1,835; and Mexico 1,799.

**Split-system heat pumps** — 63,243 units (51,122 in 1989); Canada 33,164; Mexico 9,009; France 2,163; Japan 1,944; Greece 1,560; and Britain 1,154.

**Self-contained air conditioners** — 33,385 units (108,011 in 1989); Canada 8,366; Mexico 3,415; France 3,208; Saudi Arabia 2,185; Britain 1,691; and Germany 1,071.

**Split-system air conditioners** — 93,815 units (62,424 in 1989); United Arab Emirates 13,234; Canada 12,281; Saudi Arabia 10,785; Taiwan 7,542; Japan 7,364; Indonesia 4,652; Singapore 3,957; Philippines 3,646; Hong Kong 3,324; and Greece 3,239.

**All-year heating-cooling packages** — 25,431 units (31,896 in 1989); Canada 8,948; Saudi Arabia 2,777; Mexico 1,983; France 758; Italy 548; and Kuwait 376.

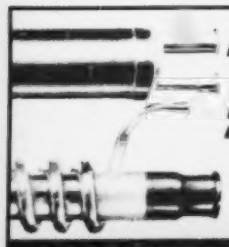
**Room fancoil units** — 25,346 units (31,336 in 1989); Indonesia 3,792; Taiwan 3,444; Turkey 2,282; Egypt 2,188; United Arab Emirates 1,872; S. Korea 1,443; Saudi Arabia 1,429; Canada 1,020; and France 922.

**Central station air handlers** — 3,563 units (5,480 in 1989); Canada 1,039; Mexico 533; Saudi Arabia 487; Venezuela 195; Egypt 185; and Hong Kong 175.

**Room terminal units** — 28,508 units (33,890 in 1989); S. Africa 5,945; Hong Kong 4,712; S. Korea 2,662; Italy 1,846; Norway 1,735; Israel 1,630; Mexico 1,575; Iraq 1,530; and Kuwait 1,184.

**Automotive air conditioners** — 640,861 units (2,658,636 in 1989); Canada 319,239; Mexico 125,607); France 73,888; Spain 35,465; Brazil 14,982; Singapore 13,933; Germany 13,015; Saudi Arabia 7,712; Belgium 5,122; and Italy 5,083.

**Condensing units 60,000 Btuh and under** — 70,042 units (79,179 in 1989); United Arab Emirates 17,175; Saudi Arabia 15,521; France 4,628; Canada 3,477; Japan 2,650; Hong Kong 2,437; S.

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Circle 3

# INTERNATIONAL

Africa 1,940; Philippines 1,793; Mexico 1,789; Singapore 1,375; Australia 1,344; and Germany 1,331.

**Condensing units over 60,000 Btuh** — 6,975 units (43,108 in 1989); Saudi Arabia 1,599; United Arab Emirates 1,335; Mexico 274; Canada 262; Australia 247; and Kuwait 242.

Of the $747,834,000 in **air conditioning machinery parts** ($415,898,000 in 1989), Canada accounted for $404.8 million; Saudi Arabia $48.9 million; Germany $40.3 million; Britain $37.5 million; Mexico $35.3 million; France $19.3 million; S. Korea $19.3 million; Japan $13.9 million; Australia $11.5 million; and Singapore $8 million.

**Room terminal units** — 28,508 units (33,750 in 1989); S. Africa 5,945; Hong Kong 4,712; S. Korea 2,662; Italy 1,846; Norway 1,735; Israel 1,630; Mexico 1,575; and Kuwait 1,184.

**Freezer display cases** — 21,388 units (19,301 in 1989); Canada 4,089; Netherlands 2,149; Mexico 1,488; Kuwait 1,378; S. Korea 1,344; Japan 1,207; United Arab Emirates 1,118; and Greece 937.

**Refrigerated display cases** — 71,645 units (55,287 in 1989); S. Korea 12,531; France 10,351; Japan 7,199; Britain 5,832; Canada 4,980; Mexico 4,326; Taiwan 3,298; Singapore 1,532; and Hong Kong 1,415.

**Icemaking machines** — 27,473 units (30,307 in 1989); Canada 5,533; Taiwan 3,533; Britain 1,701; Mexico 1,688; France 1,272; Kuwait 1,261; and Singapore 969.

**Drinking water coolers** — 160,397 units (167,800 in 1989); Canada 79,330; Israel 13,203; Britain 10,036; Hong Kong 6,257; Singapore 5,853; Spain 4,830; Thailand 4,127; France 3,701; Mexico 3,523; Japan 3,333; Ireland 2,211; and Germany 2,121.

**Open-type centrifugal chillers** — 428 units (513 in 1989); Mexico 110; Canada 91; Britain 64; Taiwan 60; Philippines 50; and Brazil 20.

**Hermetic centrifugal chillers** — 1,602 units (1,010 in 1989); Taiwan 627; Canada 218; Indonesia 148; Venezuela 114; Costa Rica 94; Mexico 80; Brazil 79; and the Netherlands 73.

**Absorption liquid chillers** — 702 units (4,713 in 1989); France 206; Canada 125; Chile 80; Spain 57; Germany 53; Japan 42; and Netherlands 28.

**Reciprocating liquid chillers** — 2,291 units (2,893 in 1989); Taiwan 394; Japan 171; Indonesia 163; Kuwait 165; S. Korea 104; New Zealand 101; and Germany 94.

**Refrigeration and freezer parts** — $148,658,000 (down 16%); Ireland $26.5 million; Canada $12.9 million; Mexico $11.6 million; Britain $11.6 million; Japan $9.7 million; Germany $5.6 million; and Australia $5.2 million.

**Thermostats** — 6,348,426 units (up 14.1%); Canada 3,503,172; Mexico 414,631; Britain 353,135; Hong Kong 320,137; Singapore 209,613; Netherlands 170,723; Italy 161,719; France 139,446; Germany 130,685; Haiti 127,992; and Saudi Arabia 103,682.

**Hvac controls** — $57,377,000 (down 29.7%); Saudi Arabia $7.3 million; Japan $7.1 million; Australia $5.8 million; Britain $5.4 million; Canada $4.8 million; and the Netherlands $3.7 million.

### Imports

According to the Department of Commerce, eight nations accounted for $1.937 billion, or 84%, of the $2,302,637,000 worth of air conditioning and refrigeration equipment and components imported into the U.S. in 1990.

Of the total 1990 imports:

• **$914.6 million came from Japan,** up 6.6% from $858.1 million in 1989, which mostly included 1,106,454 compressors of 0.25 hp or less, 954 screw compressors, 4,178,170 automotive air conditioning compressors, 1,943,290 compressors of 0.25 to 1 hp, 319,562 compressors of 1 to 3 hp, 9,000 compressors of 3 to 10 hp, 6,383 compressors over 10 hp, 182 ammonia compressors, 57,677 room air conditioners, 13,760 self-contained heat pumps, 10,008 self-contained air conditioners, 3,609 all-year air conditioners, 20,526 evaporator coils, 3,396 room fan-coil units, 1,070 central station air handlers, 2,017 room terminal units, 23,291 auto air condition-

*(Next Page, Please)*

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# WHOLESALERS

All indicators point to a most challenging year for the refrigeration and air conditioning industry, according to Air-conditioning and Refrigeration Wholesalers (ARW) president Jack Lang, who is also president of Southern Refrigeration Corp., Roanoke, Va.

ARW no longer conducts its annual wholesale sales forecast. In its place, we have asked its president to comment on past performance and to take a look at the year ahead. Lang's comments:

"The consensus opinion appears to be a year of much slower business activity in all sectors — at least for the first six months. The factors causing this all are well known: The overall slowdown of the economy (recession, if you prefer), the Middle East crisis, the federal budget deficit, and unemployment.

"All of these contribute to a very cautious feeling regarding new construction and expansion. There's definitely a reluctance to spend any excess funds available in the current economic climate. This is evident at all levels, from the consumer up through the contractor, distributor, and manufacturer.

"Even under these conditions, there are opportunities. This should be a time when we make a close examination of our business to determine its strengths and weaknesses. Maintaining a good gross profit, controlling expenses and receivables, and improving relationships with both customers and suppliers are just some of the basics that need to be attended to now.

"These are activities that, of course, should be carefully monitored at all times, but are even more critical this year. Analyzing these and other areas now, and making the necessary adjustments and improvements, can only make a company stronger and better prepared to meet the greater business demand when it comes.

"Time also would be well spent in educating our people to the upcoming changes in the areas of CFCs. Recovery and recycling of these refrigerants will be mandatory in July 1992. This entire segment of our industry is undergoing rapid change. It is a *must* that we all become familiar with these changes and how they are going to affect the way we do business in the near future.

"As these comments are being prepared in late February, it appears as though the Persian Gulf crisis might be coming to a successful conclusion. If this comes about, I'm sure it will help to foster a 'back to normal business' feeling among all of us. This might be the trigger necessary to fire up a recovery from the current recession.

"But, as these recoveries usually take time to get rolling, the more logical belief [for the recovery] is later in the year, possibly by mid-June.

"Other items fueling a recovery are fairly low interest rates and, one of the biggest factors in our business, the weather. If by chance we have a hot summer — which we haven't had for the past two years — look for a sooner and stronger return to better business times.

"The bottom line, in my view, is for a slow or flat first six months followed by a slow recovery that could be enhanced by hot weather. The end result for 1991 probably will be an overall flat year with some areas up and others down — but with an end-of-year upward trend in business activity."

### NHAW perspective

Members of the Northamerican Heating and Airconditioning Wholesalers Association (NHAW) reported an essentially flat year in 1990. Actually there was a median decline of 0.1%. For contrast, the increase in 1988 was 11.24% and, in 1987, 12%.

NHAW relies more heavily on medians (the number in the middle when individual reports are arranged from low to high) than on averages (the arithmetic mean of all results). To avoid confusion, we'll stick with medians, even though both averages and medians are included in the organization's reports.

There was a wide disparity between the regions of the country. For U.S. firms, the medians ranged from a median decline of 15.75% in Region 1 (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island) and a median increase of 21.62% for Region 12 (Idaho, Alaska, Oregon, and Washington) and 10.2% in Region 7 (Mississippi, Alabama, Georgia, South Carolina, Florida, and Puerto Rico).

Region 4 (Ohio and Michigan) experienced a 3.8% decline and Region 2 (New York, Pennsylvania, and New Jersey) experienced a 7% decline.

Small median increases were experienced by Region 8 (Oklahoma, Arkansas, Louisiana, and Texas) at 4.38%; by Region 3 (Delaware,

# INTERNATIONAL

*(Continued from Preceding Page)*

ers, 29,376 condensing units, 143,024 heat exchangers, $114.3 million in auto air conditioning parts, 4,007 ice makers, 1 centrifugal liquid chiller, 16 absorption chillers, and 7,625 refrigeration condensing units.

• **$220.9 million came from Canada,** up 52.6% from $144.8 million in 1989, which mostly included 325,335 compressors of less than 0.25 hp, 76 screw compressors, 3,315 auto air conditioning compressors, 318,322 compressors of 0.25 to 1 hp, 2,337 compressors of 1 to 3 hp, 2,245 other compressors, 30,599 room air conditioners, 870 heat pumps, 4,005 auto air conditioners, 1,136 heat exchangers, $12.5 million in auto air conditioning parts, 151,814 freezers, 3,900 refrigerated display cases, 13 absorption chillers, and 193 refrigeration condensing units.

• **$176.5 million from Singapore,** down 2.2% from $180.4 million in 1989, which mostly included 1,392,737 compressors of less than 0.25 hp, 1,423,534 compressors of 0.25 to 1 hp, 17,731 compressors of 1 to 3 hp, 162,156 room air conditioners, 64,221 self-contained heat pumps, and 7,900 self-contained air conditioners.

• **$168.7 million from Mexico,** down 6.1% from $179.7 million in 1989, which mostly included 215,626 auto air conditioning compressors, 9,172 room air conditioners, 1,100 self-contained heat pumps, 1,939 all-year air conditioners, 221,512 evaporator coils, 5,673 condensing units, $26.8 million in auto air conditioning parts, 81,706 refrigerator-freezers, 39,061 freezers, 1,280 icemakers, and 503,747 refrigeration condensing units.

• **$143.6 million from Brazil,** up 12% from $128.2 million in 1989, which mostly included 2,329,864 compressors of less than 0.25 hp, 3,940 screw compressors, 786,725 compressors of 0.25 to 1 hp, 1,600 compressors of 3 to 10 hp, 332 compressors over 10 hp, 178,570 room air conditioners, and 8,995 heat pumps.

• **$137 million from Germany,** up 253% from $38.8 million in 1989, which mostly included 567,633 compressors of 0.25 to 1 hp, 7,857 auto air conditioning compressors, 490 compressors over 10 hp, 1,390 room air conditioners, 210 all-year air conditioners, 3,568 condensing units, and $4.8 million in auto air conditioning parts.

• **$90.2 million from Malaysia,** down 20.8% from $113.9 in 1989, which mostly included 220,855 compressors of 0.25 to 1 hp, 320,822 compressors of 1 to 3 hp, 222,787 room air conditioners, and 200 room fancoil units.

• **$85 million from South Korea,** up 48.6% from $57.2 million in 1989, which mostly included 219,298 room air conditioners, 1,729 heat pumps, 2,368 room terminal units, 125,172 dehumidifiers, 8,476 refrigerator-freezers, and 1,250 refrigeration condensing units.

It is significant that imports from Britain last year amounted to $76.8 million and, from Italy, $75.3 million. Exports to the U.S. also included 4,418 screw compressors from Denmark, 1,039 heat pumps from Israel, 272,602 compressors of less than 0.25 hp and 97,826 compressors of 0.25 to 1 hp from Italy, 677 compressors over 10 hp from Sweden, 52,997 refrigerators and freezers from Yugoslavia, and 6,429 refrigerator-freezers from Turkey.

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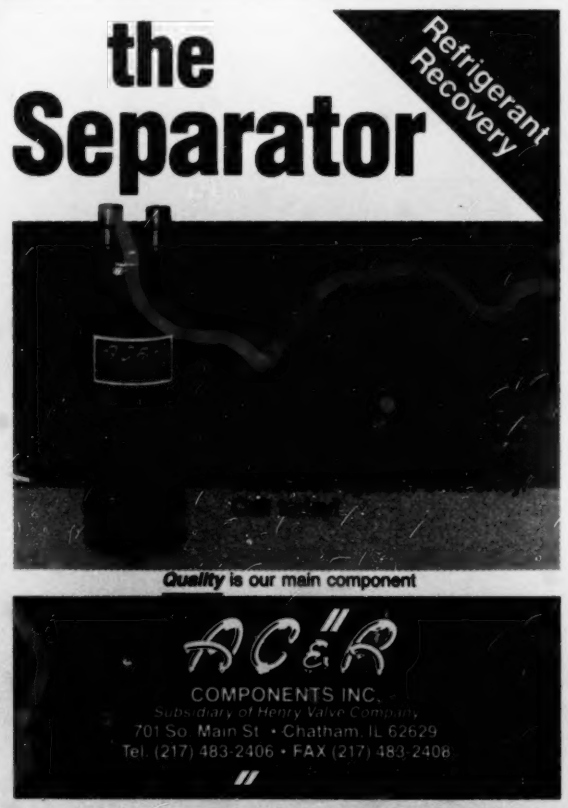
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# WHOLESALERS

Maryland, West Virginia, Virginia, North Carolina, Kentucky, and D.C) at 0.44%; by Region 6 (Minnesota, Iowa, Nebraska, Missouri, Kansas, North and South Dakota) at 0.17%; and Region 5 (Indiana, Illinois, and Wisconsin) at 0.1%.

Canadian NHAW members posted a median decline of 11% from their experience a year earlier. There was insufficient data for regions 9 and 10.

In terms of firm size, firms with sales volumes of $2 million or less (with a median increase of 6.35% over 1989), those with volumes of $4 million to $6 million (with an increase of 6%, and those with volumes between $7.5 million and $10 million (with an increase of 3%) were the only ones on the positive side.

Firms with sales volumes of $15 to $20 million suffered a median loss of 9.1% last year when measured against 1989 levels and those in the $2 to $4 million bracket suffered a median decline of 7%.

### 1990 forecast

Looking ahead, NHAW provides a quarter-by-quarter comparison of total sales — nationally and by region — compared with the identical quarter in the previous year. No longer does it provide forecasts according to product groupings.

As can be seen in the accompanying charts, the North American outlook is for a median decline of 3% in the first quarter of 1991, a 9% decline in the second quarter, and 2% and 1% declines in the third and fourth quarters of the year. It should be noted that sales in the third quarter of 1990 increased by only 1%, followed by a 1% decline in the fourth quarter.

In a broad sense, then, NHAW members expect 1991 to be a down year, especially in the first half. The forecast was prepared for NHAW by William A. Spooner and Associates, Columbus, Ohio. It relates data supplied by NHAW members with econometric models maintained at the University of California at Los Angeles (UCLA), which developed a forecast for the nation based on the DRI econometric model.

### All wholesalers

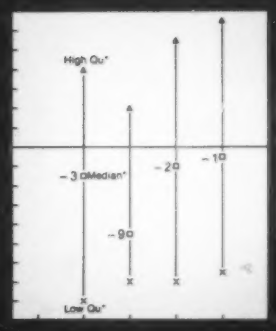
The wholesale distribution industry's confidence in the economy slipped from an index of 95.5 in the third quarter of 1990 to 89.5 for the quarter ended Dec. 31, 1990, according to the National Association of Wholesaler-Distributors (NAW).

The measurement combines fourth-quarter, 1990, historical data with first-quarter, 1991, expectations. Based on the responses of 150 companies, the survey represented a broad array of durable and nondurable goods.

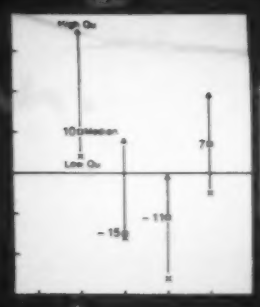
NAW vice president, communications, Ron Schreibman, said the eight measures used to develop the overall outlook for the quarter were, at best, flat. "Participants were particularly concerned about net income, which they predict will lead the decline."

Deep concern about the overall state of the economy is reflected in both actual industry employment declines and predictions for further reductions, according to Patrick Dolan of Arthur Andersen Co., which conducted the survey. Capital expenditures, predicted to decline by 6.4% in the last quarter of 1990, "are a clear reflection of the industry's concern with longer-term economic growth."

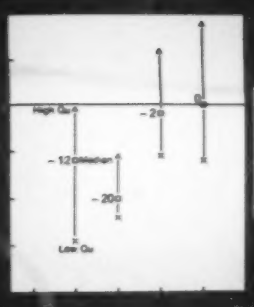
In a separate survey of wholesaler trade associations conducted Feb. 6 to 16, half of the respondents reported that the war with Iraq had no direct impact on their members' businesses. Among the others, the war exercised a stimulating or dampening effect depending on the lines carried.



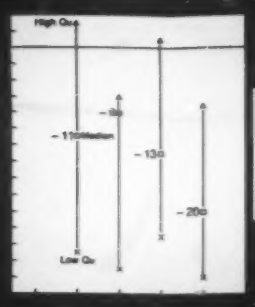

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — was off – 1%
3rd qtr '90 — ahead 1%
2nd qtr '90 — was off – 2%
1st qtr '90 — ahead 2%



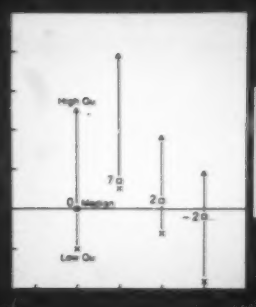

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — was off – 14%
3rd qtr '90 — was off – 9%
2nd qtr '90 — was off – 17%
1st qtr '90 — was off – 6%



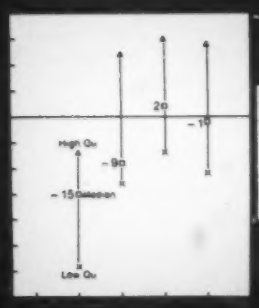

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — even 0%
3rd qtr '90 — was off –6%
2nd qtr '90 — was off – 4%
1st qtr '90 — was off – 2%



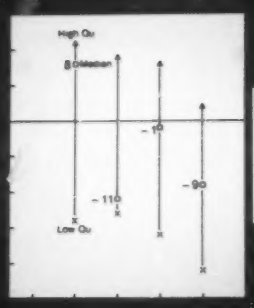

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — was off – 3%
3rd qtr '90 — ahead 10%
2nd qtr '90 — ahead 7%
1st qtr '90 — ahead 1%



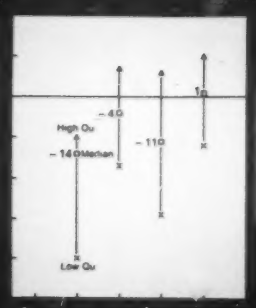

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — ahead 4%
3rd qtr '90 — ahead 9%
2nd qtr '90 — even 0%
1st qtr '90 — ahead 9%



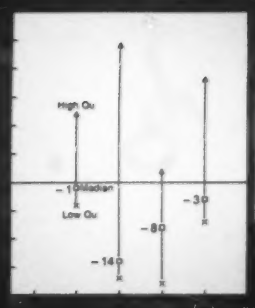

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — was off – 11%
3rd qtr '90 — was off – 10%
2nd qtr '90 — was off – 15%
1st qtr '90 — was off – 4%



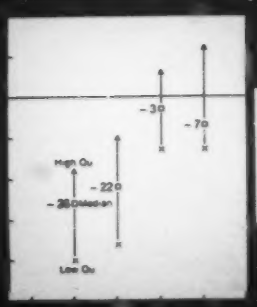

Reminders of Previous Performance:
(Most recently completed quarters as com, ared to a year-earlier)
Medians
4th qtr '90 — ahead 6%
3rd qtr '90 — ahead 3%
2nd qtr '90 — was off – 7%
1st qtr '90 — ahead 7%



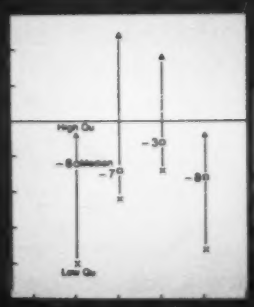

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — ahead 4%
3rd qtr '90 — ahead 11%
2nd qtr '90 — ahead 12%
1st qtr '90 — ahead 12%



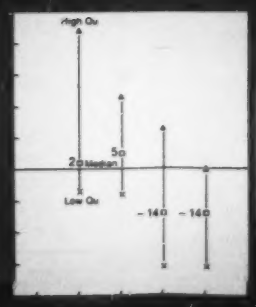

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — was off – 8%
3rd qtr '90 — was off – 11%
2nd qtr '90— was off – 19%
1st qtr '90 — ahead 3%



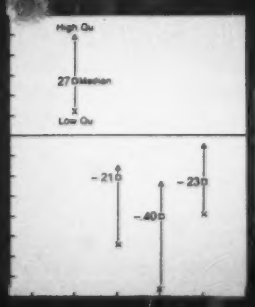

Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — was off – 7%
3rd qtr '90 — ahead 3%
2nd qtr '90 — ahead 2%
1st qtr '90 — was off – 1%




Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — ahead 2%
3rd qtr '90 — ahead 6%
2nd qtr '90 — even 0%
1st qtr '90 — ahead 5%




Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — ahead 7%
3rd qtr '90 — was off –1%
2nd qtr '90 — ahead 3%
1st qtr '90 — ahead 7%




Reminders of Previous Performance:
(Most recently completed quarters as compared to a year-earlier)
Medians
4th qtr '90 — ahead 21%
3rd qtr '90 — ahead 28%
2nd qtr '90 — ahead 17%
1st qtr '90 — was off – 1%

# CLASSIFIED MARKETPLACE

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## COOLING SHOWCASE

## CLASSIFIED MARKETPLACE

**Promote Your Products In The 1991 Cooling Showcase And Get Results!**

**Our April 22 issue of The NEWS is devoted to the cooling industry. The *Cooling Showcase* issue reaches dealers/contractors and wholesaler/distributors just before they start putting in their BIG ORDERS for air conditioning season.**

**This is a prime opportunity to sell your cooling products and services to proven buyers!**

**To advertise in the *Cooling Showcase*, call Donna Naggie at (313) 244-6498 or fax your ad to (313) 362-0317.**

**Don't forget the *Cooling Showcase* issue is April 22 and classified advertising closing date is April 15.**

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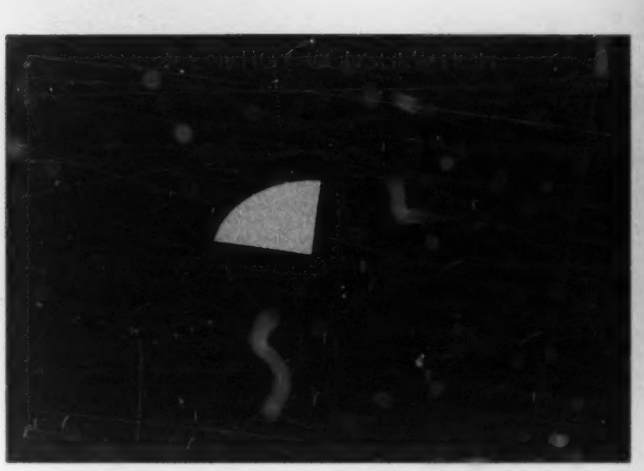
# FUELS AND ENERGY



As a nation, U.S. energy consumption for the first 11 months of 1990 was 73.802 quadrillion Btu (quads), an increase of 0.4% over the 73.502 quads consumed during the same period in 1989, according to the Energy Information Administration (EIA).

To add some perspective, the nation's energy consumption for the full year of 1989, at 81.457 quads, was only 9.7% higher than the 74.282 quads consumed in 1973, the year of the OPEC oil embargo. The 1989 total, however, did eclipse the previous year's record total of 80.196 quads. The previous high was 78.898 quads in 1979, just after the second major oil price shock.

In the residential-commercial sector (EIA lumps them together), the 26.237 quads consumed during the first 11 months of 1990 was 0.4% more than the 26.133 quads consumed by the sector in the same period of 1989. The 1989 full-year total of 29.481 quads represented a 22.1% increase over the 24.143 quads used by the residential-commercial sector in 1973.

During the first 11 months of 1990, this sector accounted for a 35.5% share of total energy consumption. This was almost the same as for 1989, but more than the 32.5% share in 1973.

Industrial sector consumption of 27.254 quads for the first 11 months of 1990 was up by 1.2% over the 26.934 quads consumed during the same period in 1989. The full-year 1989 total of 29.587 quads was 6.2% less than the 31.528 quads consumed by this sector in 1973.

During the first 11 months of 1990, the industrial sector accounted for a 36.9% share of total energy consumption, almost the same as in 1989. In 1973, the industrial sector consumed 42.4% of the nation's energy.

For the record, the transportation sector consumed 20.292 quads through the first 11 months of 1990, a 0.7% decline from the 20.432 quads consumed by the sector during the same period in 1989. It represented a 27.5% share of total energy consumption, about the same as in 1989. The share in 1973 was 25%.

Electric utilities consumed 26.964 quads during the first 11 months on 1990, an increase of 1.4% over the 26.584 quads consumed during the same period a year earlier. The 1989 full-year total of 29.284 quads was 47.5% more than the 19.85 quads consumed by electric utilities in 1973.

Of the 26.237 quads consumed by the residential-commercial sector during the first 11 months of 1990 (with the share for the same period in 1989 in parentheses), only 0.51% (0.48%) was coal, 23.9% (24.8%) was natural gas, 8.6% (8.9%) was petroleum, 21% (20.4%) was electricity, and 23.6% (23.7%) was electricity generation and transmission losses.

Similarly, the 27.254 quads used by the industrial sector during the first 11 months of 1990 broke down this way: 9.2% (9.6%) was coal, 28.8% (27.6%) was natural gas, 27.5% (28.3) was petroleum, 10.8% (10.6%) was electricity, and 23.6% (23.7%) was electricity generation and transmission losses.

**Each *Statistical Panorama* includes the latest data available. Sources frequently revise their previous year's figures, which explains apparent discrepancies between the latest and earlier published data. Where sources give significantly varying information, that data is mentioned.**

More data on "Fuels and Energy" will be published in next week's edition of *The News.*

# Nat'l energy strategy unveiled

On Feb. 20, President George Bush presented the outline of a national energy strategy that, over the next 20 years, promises a balanced approach to production and conservation "to make the U.S. more energy efficient and enhance our competitiveness without resorting to heavy-handed regulations, taxes, or import fees that can hurt consumers and cost American jobs."

The main planks of the strategy are aimed at reducing domestic oil demand by 3.4 million barrels/day, increasing domestic oil production by 3.8 million barrels/day, increase electricity generated from renewable resources by 16%, increase the use of alternative transportation fuels by the equivalent of 2 million barrels of oil/day, and reduce the growth in electricity demand by 10%.

Environmental objectives include holding emissions of greenhouse gases at or below 1990 levels, improving outdoor air quality, reducing coal ash waste by 25 million tons/year, and coal-cleaning wastes by 50 million tons/year.

In addition to specific suggestions for energy supply, transportation, utility, and industrial initiatives, the announcement also provided a program that directly and indirectly affects the future of the hvacr industry. Some highlights:

- Accelerated research and development for residential and commercial building technologies with a 22% increase in federal funding for fiscal year 1992 to $55 million.
- Encouraging home mortgage lenders to share energy efficiency ratings with prospective home buyers.
- Setting cost-effective energy efficiency standards for appliances as provided under current law.
- Expanding federal energy efficiency labeling programs to include such other equipment as light bulbs.
- Supporting state and utility investments in energy efficiency as an alternative to power plant additions.
- Providing tax-free treatment of utility discounts on consumers' electric bills for efficiency investments.
- Develop and encourage the use of cost-effective building efficiency standards.

According to Bush, the floor space of commercial buildings is expected to grow by 57% by the year 2010 but the energy needed to heat, cool, and light that space should increase by only half of that amount. A 24% increase in occupied housing in the same time frame should result in only 10% more energy demand.

Details of the strategy are expected to be contained in a legislative package the administration promises will be sent to Congress "shortly."

# LABOR

Higher wage settlements and longer contracts were clear trends among the construction industry union labor contracts negotiated in 1990, according to the Construction Labor Research Council (CLRC).

Settlements in contracts negotiated last year resulted in average first-year wage increase of 83 cents/hour, or 3.8%, and 90 cents/hour (also 3.8%) for the second year of multiyear contracts. It was the first year since 1982 that the average first-year settlement exceeded 3%.

The first-year settlement level represents a jump from 65 cents/hour, or 2.9%, reported in 1989. The average in 1988 was 47 cents/hour, or 2.2%. The higher settlements in 1990 were primarily the result of a decline in contracts containing wage freezes, the almost disappearance of rollbacks, and bargaining results in the East North Central region, according to CLRC.

The average second-year settlement of 90 cents/hour, or 3.8%, has been equalled twice since 1984. There was also less variability among second-year increases. More than half were between 3% and 5%.

Of the 83-cent first-year increase, 47 cents/hour went for higher wages. And, in keeping with a recent trend, a large part of the total — 22 cents/hour — was added to health and welfare contributions. This was 15% more than the contribution rate in old agreements. The remainder was split between an 11-cent increase in pension funding and 3 cents for other benefits.

A primary reason for the higher national settlement average was the higher amounts in East North Central region contracts, which exceeded the national average by nearly 30 cents/hour. High settlements also were recorded in the Pacific Southwest but there was only light bargaining there in 1990.

No multiyear contracts were negotiated by sheet metal worker locals and, although two-thirds of pipefitter agreements were for two years, there were no three-year contracts negotiated by the UA last year.

In a report late last year to the board of directors of the Sheet Metal and Air Conditioning Contractors' National Association, SMACNA's Labor Committee reported that the percentage of sheet metal work performed by union contractors in 1985 was 58.4%. By 1989, it had slipped to 50.2% and, last year, to 49.9%. The committee projected that, in 1991, the union share will shrink further to 48.5%.

Even though comparisons of 1989 and 1990 might indicate little difference in construction activity, CLRC said that conclusion is misleading because the construction industry was growing in 1989 and in decline last year. Construction unemployment also is trending upward and is likely to finish the year at more than 13%, a four-year high.

CLRC said that, while comparable data do not exist, "it appears that [wage] rates are increasing more rapidly for nonunion than for union workers."

### UA and SMWIA

Of the 34 contracts negotiated by the United Association (UA) pipefitter and pipefitter-plumber locals in 1990, the average first-year settlement was $1.08/hour, or 4.6%. And, of these, 21 agreements included second-year increases of $1.11/hour, or 4.3%.

Of the 32 agreements negotiated by locals of the Sheet Metal Workers' International Association (SMWIA), the average settlement was 90 cents/hour, or 3.9%. Again, the union did not negotiate any multiyear agreements.

So far, we have dealt only with union wage rates where the information is more readily available. Data for open shops, which account for about 80% of the nation's hvac contractors, is more difficult to obtain.

A survey of *News* readers, published Oct. 22, 1990, revealed that three of 10 had payroll labor costs, including fringes, of $14 to $18/hour. Another two of 10 had payroll costs of $19 to $24/hour.

On the other hand, union shops pay more. Three of four were almost equally divided on payroll labor cost ranges of $19 to $24, $25 to $29, and $30 to $34.

ADVERTISING PROSPECTUS

COOLING SHOWCASE

Promote Your Products In The 1991 Cooling Showcase And Maximize Your Sales!

Investment Deadline: April 10, 1991 ◆ Issue Date: April 22, 1991

Tough times call for solid investments. Experts are recommending advertisers focus their ad dollars in their industry's #1 publication - - the one that delivers the elite buyers.

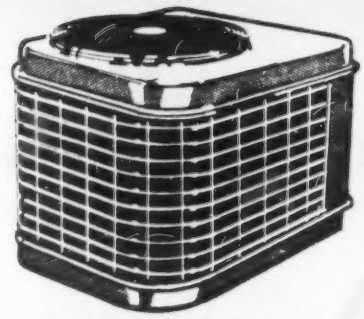
Your industry's #1 publication - - **Air Conditioning, Heating & Refrigeration NEWS** - - delivers those buyers 52 times a year. And the timing for reaching those buyers couldn't be better because the annual **Cooling Showcase** issue will be published **April 22 - - peak buying time!**

The **Cooling Showcase** issue reaches dealer/contractors and wholesaler/distributors just before they start putting in their BIG ORDERS for air conditioning season.

You can bet wholesalers like W.W. Grainger, Thermal Supply, R.E. Michael, Pameco Air, Baker Brothers, Johnstone Supply, G.W. Berkeimer, Sid Harveys, C.C. Dickson, and thousands more will be looking for the best products to sell this spring.

**Bonus, Bonus, Bonus**

In addition to reaching the all-paid **NEWS** circulation,you'll get a **FREE** advertising boost because **Cooling Showcase** issues will be distributed from our booth at the **HVAC &Building Systems Congress** in Anaheim April 22-23. Talk about a hot spot for promoting your cooling products!



**Need New Dealers or Reps.?**

A single new dealer, distributor, or rep. can produce hundreds of thousands of dollars in sales for your company. No publication is better than **The NEWS** at gaining you an audience with stable, long-term, high-volume hvac/r pros. If you're looking to make a new sales connection in time for spring, put your message in the **Cooling Showcase.**

Kick off your new sales success today! Contact your sales representative or our publishing headquarters to discuss how advertising in the **April 22, 1991 Cooling Showcase** can help you. Hurry. Ad closing is **April 10.**

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